RESOURCE RENTS & PUBLIC POLICY

EDITED BY THOMAS GUNTON AND JOHN RICHARDS

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Resource Rents and Public Policy in Western Canada

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Edited by

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and
John Richards

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This book is dedicated to the memory of Lawrence W. Copithorne whose scholarship on the same subject was path-breaking. Most notable is his study, *Natural Resources and Regional Disparities*, published by the Economic Council of Canada in 1979.

While head of the Economics Department at the University of Calgary in 1984, Dr. Copithorne was a member of the faculty liaison committee that consulted regularly with the director of the Institute's Western Resources Program, then based on the campus. He enthusiastically supported plans to publish this volume on resource rents; moreover, he contributed extensive and thoughtful comments in reviewing an earlier draft. We deeply regret that Lawrence Copithorne did not live to see this book and to use it in his teaching as he had anticipated.

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Foreword

The general equilibrium model of economic theory is a fiction that cannot deal with the contemporary world of inflation, unemployment, the accumulation of the few and the poverty of many. No principles of allocation of resources or distribution of incomes can be inferred from its abstractions. It defines economic method as a least-cost application of resources to ends that are given, that may be anything, with or without purpose, with or without values. The model allows no ranking, no order of priorities – it is a closed system of equations, digits and diagrams, isolated from the contemporary, the cultural and the human environment.

Economics enshrines no values and no principles. There is nothing to be passed on or to be legitimated. There are no distinctions to be made in language, culture, traditions, family and social loyalties. Equilibrium economics is, to put it briefly, not earth-bound, not culturally conscious nor concerned with people.

Thus, our problems with linking resource economics to the neo-classical theory for resource economics deals with all three – the resources of the earth, the efforts, knowledge and skills of people, their attitudes to the integrity of nature and the purposes for which they form into community.

The roots of a society are a group of people gathered together in a particular place. While each member will have had his own reasons for settling and for staying – a fleeing from discrimination, a moving toward preferred institutions, a simple search for opportunity – it is certain that over time there will be a gradual harmonisation of values, expectations and viewpoints. In the beginning at least, the community knows the value of collaboration and cooperation.

To a great degree, this meeting of minds will be imposed by nature itself for the possibilities inherent in the environment and the resource base determine the scope if not the limits of man's activities. In a country as large as Canada, there will be regions that differ in resource base, climate and economic possibilities. The men and women who come to a region invest their lives and their trust in that world. Each will accept the environment for what it is and will strive to shape it and to use it rationally and consistently within the limits that nature itself imposes. In this union of people with their environment, there is the promise of a continuity that should survive all but the greatest social upheavals.

At this level of community, the values embrace all modes of man's existence, the religious, the social, the cultural and the economic. And it is principally at this level that men and women have the greatest freedom of choice as they face a future in which the principal directions of living and meaning are open to them. The community is the solid core of the social system.

The community grows and soon develops the principles and norms of conduct, the institutions, the laws and the forms of government that reflect the beliefs and value systems of its members and guide their internal conduct and collective approach to the outside world. Fundamental to this creation of meaningful civic relations is the individual's surrender of his own use of force and the assignment of monopoly powers of coercion to the civil authorities. Without this transfer there could not be community. There could only be confusion and anarchy.

What does society lose when more complex forms of political integration, inspired by claims of increased efficiency, growth and output, are introduced? For one thing, society then finds it difficult to answer David Reisman's question, 'Abundance for what?' This is not a relevant or pertinent question at the community level where sharing is the distinguishing feature of social living and where no man need feel alone. If the question were raised there, the answer would be clear and unequivocal. A large production and a good distribution of that production go hand in hand. That is what community is all about.

But these larger and more complex groupings do not have this generation's standard of living necessarily in mind. Riesman's questions are ignored. Materialism has no room for humanism. Production is not primarily for a good distribution but for more production. It is true that we build the industrial power to produce but we do not expand the capacity of households to consume in tandem. As a result more and more of the greater output remains the property of fewer and fewer members of the society. It becomes not only morally but politically intolerable that in the midst of affluence a growing percentage of the community should live below the poverty line. When wealth and the rate of tomorrow's growth become goals that insert themselves ahead of equitable distribution and improvements in the present standard of living, today's generations are left high and dry.

The roots of any community are two – the people and the land. These are the basic factors with capital, knowledge and technology being derived from or through them. If the land is not attractive or yields but little, few will come or stay. If the land yields much and *if this is retained*, the community will grow and prosper. If, however, the surpluses are drained away, the community will stagnate in an accelerating dependence.

It is in the very nature of the commercial corporation, large or small, to drain a market or an environment. All private economic activity – agricultural, industrial, services – has the simple aim of drawing out surpluses and draining the value inherent in the contributions of human effort and the resources of nature. With the corporate form, we have built the capacity to produce goods and services to unimagined levels. But we have permitted these same corporations to substitute their own aims of growth in wealth and power for society's aims of an improving standard of living for all citizens. By allowing corporations to accumulate and compound their wealth and assets continuously, we have failed to insist that what has been produced be distributed immediately to enable consumption and society's standard of living to keep pace. An economic system does not thrive on production alone. It keeps going by spreading around what has been produced. Without a system of distribution that clears the market, 'wealth accumulates and men decay'. The corporation has become an end in itself and for itself.

The difference between colonial status and a sovereign nation lies in the control of one's own territory. Canadians are a sovereign people anxious to preserve autonomy over their fundamental institutions; therefore, the citizenship of those who own and control the lands and resources must be of paramount importance. For Canadians, to sell their land and markets out from under their feet is to make themselves, and future generations, colonials and dependents.

Karl Polanyi's dictum has an overwhelming significance for Canadians—'What we call land is an element of nature inextricably interwoven with man's institutions. To isolate it and form a market out of it was perhaps the weirdest of all the undertakings of our ancestors.' And yet this is exactly what Canadians have done and are doing. Canada is not only 'open for business', CANADA IS FOR SALE.

Our policy-makers have never recognized, and do not now recognize, that nation-building depends on using, developing and improving what one has, that growth and development depend on capital accumulated at home, that control of one's own economy is the only method of asserting one's own independence and enabling the nation to cooperate internationally without submitting to the pressure of other nations pursuing *their* national interests.

Our major mistake was the decision that the citizenship of capital is not important. This being so, the supply of capital was no longer a problem since the mobility of capital was a given and Canada no longer had to rely on her own savings but could import as much capital as needed.

Unfortunately, the arrangements under which capital could be imported had also changed. In the nineteenth century, American needs for capital were met with loans which did not reduce the need for savings to pay back the credits. Canadian needs for capital were resolved by the simple sale of part of the nation, the sale of land, resources, markets and now, if some should have their way, the sale of our waters. We had the benefits of the inflows of capital with no costs except, in the eyes of our Ottawa mandarins, the nebulous price of a loss of sovereignty and control of large sections of our economy.

Canadians, nationalists if you will, believe that we can do more for ourselves, that we can stand on our own feet. We certainly have a sufficiently high savings rate and we are capital-conscious. We have a wealth of entrepreneurial talent, of resources, human and material. We have a duty and a responsibility to look after our own interests. Why should we apologize if the times demand a concerted policy leading to an expansion of output for our home markets, to relieve the pressure for expanded export markets in a declining environment? Neither the invisible hand nor American paternalism will secure Canada's future. Only Canadians can do that.

The message of this volume is quite 'straightforward' as the authors have outlined—'it suggests that by pursuit of some aggressive reforms, Western Canadians, as owners of resources held by the crown, could receive substantially more economic value from the resource sector than they do now." I agree.

What is the definition of 'western interest' in the development of their resources? Constitutionally, the provinces are the owners, with small historical exceptions, of the resources within their boundaries. It follows that, at least to the primary stage, the people should be assured of the best possible return. That is a simple economic principle. That is the value that counts and whether the people as a whole are to benefit or a few giant firms, as has been the reality, is the key issue.

Obviously, if the people in a province want to know the value – revenue less cost including a normal profit on the capital employed – of a particular ore body or oil and gas wells within their borders, they are not interested in a holding company's balance sheet that may include deductions for exploration and development in Australia or Ireland, the depreciation of office buildings in Atlanta, nor the returns from investments in affiliates and acquisitions. Given public ownership of resources as an intrinsic feature of the Canadian constitution, this amounts to saying that vertical integration can begin above the ground but not below it. This is neither nationalism, socialism nor any other ideology. It is simply an aspect of our institutions that makes resource policy infinitely less complicated than in the United States, where sub-surface rights are privately held. We do not have the private market in resource rights that exists south of the border. In Canada, the people's heritage should not be turned over to the private sector, domestic or foreign, for less than its full value.

Those members of the business community, who are so fond of quoting Mill and, in particular, his statement that 'Laisser-faire, in short, should be the general practice,' should read the whole book. He never made the mistake of attempting to integrate the returns from nature's gifts with the returns from produced goods – wages and profits. Rent, for Mill, belonged to the state.

Governments alone can make the proper decisions about the rate of exploitation of their natural resources. The essence of wise resource policy must be the determination of the most profitable rate of return over time, taking full account of our responsibility to the future as well as the present generations.

No private corporation can make such a determination. The corporation must maximize its returns in the present and immediate future short of spoiling its own markets. For the private sector is plagued with uncertainty about the direction of its leases, changes in legislation and fiscal reforms.

In 1961, at the Resources for Tomorrow Conference, Professor Easterbrook noted that 'our main stages in growth can be marked out by shifts from one dominant staple or resource to another', and cited as examples fish, fur, forest products, wheat, base and precious metals, hydroelectric power development and so on. Today, of course, the 'so on' would include oil and gas. Professor Easterbrook then went on to bring up the following point. 'This concentration on a limited number of export staples is common in newly emerging areas of growth, but Canadian experience raises the question as to why we have remained *so long confined* within the framework laid down in the early days of continental expansion.' Professor J.J. Deutsch, discussing the paper, quoted approvingly an unidentified observer of the Canadian scene who had described Canada as 'a country rich in resources, but poor in policy'.

The description fitted then and it still fits. Canadian resources policy has been a failure because we have given away the rents from our own resources – given them away in exchange for miniscule taxes and the wages of exploitation. The federal government, making policy, had no interest in better deals since the surpluses would not accrue to them. The provinces, through negligence and/or ignorance, stood idly by. In the process, they were never able to move away from dependence on still more resource development.

This is really the answer to Professor Easterbrook's question for by yielding up these surpluses to others, we did not gain the means to pursue our own priorities and invest in those sectors of the economy appropriate to further the expansion and growth of this nation.

Resource Rents and Public Policy in Western Canada should go far to impress upon provincial policy-makers the importance of sound stewardship of their remaining resources. If this book convinces provincial politicians that the essence of sound economic policy for them is that they retain control of their own rents, that they never give them up but use them for their own purposes and priorities, then the appropriate reforms of existing resource policy will do more for the provinces than all the private investment that buys up their lands and resources will ever do.

Eric Kierans
February 1987

Avant-propos

Le modèle d'équilibre général de la théorie économique est une fiction qui ne tient aucun compte des problèmes actuels d'inflation, de chômage, de richesses accumulées par certains et de pauvreté d'un très grand nombre. Aucun principe de répartition des ressources ou de distribution des revenus ne peut découler des théories abstraites de ce modèle, qui définit la méthode économique comme étant l'utilisation à moindres frais des ressources à des fins données, quelles que soient ces fins, quel qu'en soit le but, quelle qu'en soit la valeur. Ce modèle ne prévoit aucun classement, aucun ordre de priorités; c'est un système hermétique d'équations, de chiffres et de schémas, totalement indépendant de l'environnement culturel et humain actuel.

L'économie ne possède ni système de valeurs, ni principes; rien à transmettre, rien à légitimer. Aucune distinction de langue, de culture, de tradition, de loyauté familiale et sociale n'entre en ligne de compte. En résumé, l'équilibre économique ne se préoccupe d'aucune situation géographique, d'aucune conscience culturelle, d'aucun élément humain.

C'est pourquoi les problèmes que nous éprouvons à faire le lien entre l'économie des ressources naturelles et la théorie néoclassique de cette économie se retrouvent à ces trois niveaux : celui du sol, celui des efforts, des connaissances et compétences des individus, de leur relation avec l'environnement et celui des buts qu'ils poursuivent lorsqu'ils décident de former une communauté.

Lorsqu'un groupe d'individus se rassemble dans un même lieu pour s'y fixer, les racines d'une société peuvent se développer. Certes, à l'origine, chacun a pu avoir ses propres raisons pour prendre une telle décision, que ce soit pour fuir la discrimination, pour se rapprocher d'établissements de son choix, ou simplement dans l'espoir d'une vie meilleure, mais avec les années, les valeurs, les aspirations et les points de vue de ces différents individus finissent par s'harmoniser. A ses débuts tout au moins, la communauté connaît la valeur de la collaboration et de la coopération.

Cette entreprise commune sera en grande partie imposée par la nature elle-même, car ce sont les possibilités inhérentes à l'environnement et aux ressources qui vont déterminer l'étendue, sinon les limites, des activités de l'homme. Dans un pays aussi vaste que le Canada, les régions diffèrent grandement les unes des autres quant à leurs ressources, leur climat et leurs possibilités économiques. Les hommes et les femmes qui viennent s'installer dans une région donnée y placent tous leurs espoirs. Chacun doit être prêt à accepter l'environnement tel qu'il se présente et à faire de son mieux pour le modeler et le mettre à profit de façon rationnelle, dans les limites imposées par la nature. Cette symbiose permet d'espérer une continuité à toute épreuve, que seule une catastrophe sociale démesurée pourrait menacer.

A ce niveau de la communauté, les valeurs englobent tous les modes d'existence de l'homme : le religieux, le social, le culturel et l'économique. Et c'est dans ce contexte que les hommes et les femmes ont la plus grande liberté de choix face à un avenir qui a un sens. Cette communauté est la structure même du système social.

Au fur et à mesure de la croissance de la communauté, les principes et les normes de conduite se développent, de même que les institutions, les lois et les formes de gouvernement, reflets des croyances et des valeurs de ses membres et guide de leurs convictions personnelles et de leur attitude collective vis-à-vis du monde extérieur. Parallèlement à la création de ces relations civiques fondamentales, l'individu renonce à son usage personnel de la force et délègue le monopole du pouvoir aux autorités civiles. Sans ce transfert, la communauté ne pourrait pas exister. On n'y trouverait que confusion et anarchie.

Que peut perdre la société lorsque des formes plus complexes d'intégration politique lui sont imposées, au nom d'une efficacité, d'une croissance et d'une production grandissantes? Tout d'abord, la société aurait des difficultés à trouver une réponse à la question de David Reisman : "L'abondance, pour en arriver à quoi?" Cette question n'a pas de sens dans une communauté où tout est partagé équitablement et où personne ne doit se sentir seul. Si cette question y était posée, la réponse serait claire et sans équivoque. Une production importante et un partage équitable de cette production vont de pair. C'est le principe même de la communauté.

Mais les grandes communautés, plus complexes, ne vivent plus selon les principes de la génération précédente. Elles ne tiennent pas compte des questions de Reisman. Le matérialisme ne se soucie pas de l'humanisme. On ne produit pas pour répartir équitablement mais pour produire davantage. Le développement de l'industrie permet d'augmenter la production, mais le pouvoir d'achat des individus ne rend pas possible une consommation en conséquence. Il en résulte que la plus grande partie de la production reste la propriété d'un pourcentage de plus en plus restreint d'individus. Il devient non seulement moralement mais aussi politiquement intolérable qu'un nombre grandissant de personnes vivent au-dessous du seuil de pauvreté dans une période d'abondance. Si l'acquisition des richesses et l'accroissement du rythme de production deviennent prioritaires au détriment de la répartition équitable des ressources et de l'amélioration du niveau de vie, alors ce sont les générations actuelles qui vont en souffrir les dures conséquences.

Les racines d'une communauté sont doubles : les gens et le sol. Ce sont les deux principes desquels dérivent le capital, la connaissance et la technologie. Si la terre n'est pas hospitalière ou si elle est modérément fructueuse, peu de gens viendront s'y installer ou y resteront. Si la terre est productive et *si ses ressources sont bien exploitées*, la communauté se développera et deviendra prospère. Toutefois, si l'excédent des ressources profite à d'autres, la communauté végétera et deviendra de plus en plus dépendante des autres communautés.

C'est dans la nature même de l'entreprise commerciale, qu'elle soit grande ou petite, de drainer le marché ou l'environnement. Toutes les activités économiques privées – l'agriculture, les industries, les services – n'ont qu'un but, celui de faire des profits et de drainer à leur avantage les résultats des efforts humains et des ressources de la nature. Grâce au système d'entreprises, nous avons maintenant la possibilité de produire des marchandises et de fournir des services presque sans limites. Mais nous avons également en contrepartie laissé les entreprises altérer la raison d'être de la société, qui est d'améliorer le niveau de vie de tous les citoyens, au profit de la poursuite de leurs propres buts, qui sont de croître en richesse et en puissance. Nous avons permis aux entreprises d'accumuler et de multiplier leurs richesses et leurs biens de façon continue, sans insister sur le fait que ce qui a été produit doit être distribué immédiatement, afin d'en permettre la consommation pour que le niveau de vie de la société suive le pas. La production n'est pas le seul facteur qui permette à un système économique de prospérer. Il faut également que les produits soient distribués. Sans un système de distribution qui dégage le marché, "les richesses s'accumulent et les hommes dépérissent". L'entreprise est devenue une fin en soi et pour soi.

La différence entre une colonie et un Etat souverain, c'est la possibilité de pouvoir ou non contrôler son propre territoire. Le Canada est un pays souverain qui aspire à préserver l'autonomie qu'il a sur ses institutions fondamentales; c'est pourquoi la nationalité de ceux qui possèdent et contrôlent la terre et les ressources est d'une importance capitale. Si les Canadiens perdent le contrôle de leurs terres et de leurs marchés en les vendant aux plus offrants, ils risquent fort, eux et les générations futures, de devenir des colonisés.

La remarque de Karl Polanyi prend une signification alarmante pour les Canadiens : "Ce que nous appelons terre est un élément de la nature inextricablement lié aux institutions des hommes. De l'avoir isolée et d'avoir créé un marché à partir de cela est peut-être ce que nos ancêtres ont fait de plus étrange." Et pourtant, c'est ce qu'ont fait et continuent de faire les Canadiens. Le Canada est non seulement "ouvert pour affaires", MAIS IL EST AUSSI A VENDRE.

Les responsables politiques n'ont pas encore compris qu'une nation se construit à partir de l'utilisation judicieuse des richesses naturelles d'un pays. La croissance et le développement dépendent du capital accumulé dans le pays, et le contrôle de l'économie est le seul moyen d'assurer l'indépendance économique et de permettre à la nation d'être active au niveau international, sans être soumise aux pressions d'autres nations à la poursuite de *leurs* propres intérêts nationaux.

Notre erreur la plus grave a été de décider que la nationalité des capitaux était sans importance. Le besoin de capitaux cessait ainsi d'être un problème puisque l'argent circulait librement et que le Canada n'avait plus à compter exclusivement sur ses propres fonds : il pouvait importer tous les capitaux dont il avait besoin.

Malheureusement, les conditions d'importation de capitaux ont changé elles aussi. Au dix-neuvième siècle, les Américains pouvaient faire des emprunts qui ne les empêchaient pas d'économiser les montants nécessaires au remboursement de leurs dettes. Au Canada, on a simplement vendu des parcelles du pays pour faire entrer des capitaux, on a vendu des terres, des ressources, des marchés. Aujourd'hui, si on laissait faire certains polticiens, on vendrait même nos eaux territoriales. Ceci nous a permis de voir l'argent entrer au pays sans qu'il nous en coûte, si ce n'est, aux yeux de nos mandarins d'Ottawa, le prix nébuleux de la perte d'une souveraineté et du contrôle d'énormes secteurs de notre économie.

Des Canadiens, appelez-les nationalistes si vous voulez, pensent que nous pouvons faire mieux que cela pour nous-mêmes et que la situation peut être rétablie. Le taux de notre épargne est certainement suffisamment élevé et nous avons le sens des investissements. Le pays ne manque pas d'individus entreprenants ni de ressources humaines et matérielles. Il est de notre devoir et de notre responsabilité de nous préoccuper de nos propres intérêts. Pourquoi devrions-nous nous excuser si les conditions actuelles exigent de nous une politique concertée en vue d'un accroissement de la production pour nos propres marchés, et afin de soulager la pression sur les marchés d'exportation, dans un environnement qui s'affaiblit? Ni "la main invisible" ni le paternalisme américain ne pourront assurer l'avenir du Canada : seuls les Canadiens ont ce pouvoir.

Le message de cet ouvrage est "sans détour", comme l'ont indiqué les auteurs – "les Canadiens de l'Ouest, en tant que détenteurs de ressources naturelles de la Couronne, pourraient obtenir beaucoup plus d'avantages économiques qu'ils n'en ont à l'heure actuelle, si des réformes audacieuses étaient entreprises." Je suis bien d'accord avec eux.

Comment peut-on définir "les intérêts de l'Ouest" dans le développement des ressources? Selon la Constitution, les provinces sont propriétaires des ressources qui se trouvent dans les limites de leurs frontières, à quelques exceptions historiques près. Il s'ensuit que, au premier stade tout au moins, leurs habitants devraient avoir l'assurance d'en retirer les meilleurs avantages. C'est un principe économique de base. C'est ce qui compte, et de savoir si les bénéfices devraient aller aux citoyens en tant que groupe ou à quelques firmes importantes, comme c'est le cas à l'heure actuelle, est la véritable question. Il est évident que si les habitants d'une province veulent connaître la valeur – le revenu moins les coûts, y compris le profit normal sur le capital utilisé – d'un minerai particulier, d'un gisement de gaz naturel ou d'un puits de pétrole situé sur leur territoire, ce ne sont pas les livres de compte de la compagnie de contrôle qui les intéressent, avec toutes les déductions des coûts de l'exploration et les développements en Australie ou en Irlande, la dépréciation des immeubles d'Atlanta et les revenus des investissements dans les sociétés affiliées et les acquisitions. La propriété publique des ressources étant intrinsèquement du ressort de la Constitution, ceci revient à dire que l'intégration verticale peut commencer au-dessus du sol, mais pas au-dessous. Ce n'est ni du nationalisme, ni du socialisme, et ça ne relève d'aucune autre idéologie. C'est tout simplement un des aspects de nos institutions, qui fait que nos politiques sur les ressources naturelles sont beaucoup moins compliquées qu'aux Etats-Unis, où les droits au-dessous du sol sont propriété privée. Nous n'avons pas de marché privé des droits sur les ressources, comme c'est le cas chez nos voisins du sud. Au Canada, l'héritage des citoyens ne doit en aucun cas passer aux mains du secteur privé, qu'il soit domestique ou étranger, à un prix inférieur à sa valeur.

Les hommes d'affaires qui aiment tant citer Mill, en particulier cette phrase : "tout le monde devrait pratiquer une politique de laisser-faire", devraient lire cet ouvrage en entier. Mill n'a jamais fait l'erreur d'essayer d'intégrer les revenus des ressources naturelles aux revenus des produits manufacturés — salaires et profits. Pour lui, les revenus des ressources naturelles sont la propriété de l'Etat.

Seuls les gouvernements peuvent prendre les décisions appropriées, quant à l'exploitation de leurs ressources naturelles. Une bonne politique sur les ressources devra déterminer ce qui est le plus profitable à longue échéance, en tenant compte des responsabilités que nous avons envers les générations d'aujourd'hui et les générations futures.

Aucune entreprise privée n'est en mesure de prendre de telles décisions. Les entreprises, en effet, doivent s'assurer, pour le présent et l'avenir proche, d'un maximum de revenus, dans la mesure où le marché le permet, car le secteur privé est menacé d'incertitudes concernant l'attribution des concessions, les changements de législation et les réformes fiscales.

En 1961, lors de la conférence sur les Ressources de demain, le professeur Easterbrook avait fait remarquer que "les grandes étapes de notre croissance sont marquées par les passages successifs de l'exploitation d'une ressource principale à une autre". Il donnait en exemples la pêche, les fourrures, les produits forestiers, le blé, les métaux communs et les métaux précieux, l'exploitation de l'énergie hydro-électrique, et ainsi de suite. Aujourd'hui, "ainsi de suite" se traduirait par le pétrole et le gaz naturel. Le professeur Easterbrook avait ensuite ajouté : "Cette concentration sur un nombre limité de ressources exportables est chose commune dans les régions où le développement est récent, mais l'expérience canadienne nous force à nous demander pourquoi nous sommes restés *si longtemps* *cantonnés* dans les limites d'expansion continentale définies depuis tant d'années." Le professeur J.J. Deutsch, dans un commentaire de la communication, avait cité un observateur anonyme de la scène canadienne, qui décrivait le Canada comme "un pays riche en ressources, mais pauvre en politiques."

Cette description était justifiée à l'époque, et elle l'est toujours. Les politiques canadiennes sur les ressources ont échoué parce que nous avons renoncé aux revenus de nos propres ressources – nous y avons renoncé en échange de taxes minuscules et des salaires d'exploitation. Le gouvernement fédéral, en créant ses politiques, n'a jamais montré aucun intérêt pour obtenir de meilleurs contrats, puisque les surplus ne lui étaient pas acquis. Quant aux provinces, que ce soit par négligence et/ou par ignorance, elles sont restées inertes, et de ce fait n'ont jamais eu d'autre choix que de dépendre de plus en plus de la création de nouvelles exploitations de ressources.

Voilà bien la réponse à la question du professeur Easterbrook, car en cédant ces surplus à autrui, nous avons perdu la possibilité de poursuivre nos propres priorités et d'investir dans les secteurs de l'économie appropriés à l'expansion continue et au développement de cette nation.

Revenus des Ressources Naturelles et Politique générale dans l'Ouest Canadien est un ouvrage qui devrait faire sentir aux politiciens provinciaux qui élaborent les politiques l'importance d'une saine organisation des ressources qui leur restent. Si ce livre arrive à convaincre les politiciens provinciaux qu'il est essentiel de garder le contrôle de leurs propres revenus, de ne jamais le céder et de s'en servir pour les besoins et priorités de la province, alors les réformes appropriées des politiques actuelles sur les ressources serviront les intérêts des provinces mieux que ne pourront jamais le faire tous les investisseurs privés qui achètent leurs terres et leurs ressources.

Eric Kierans
Février 1987

Preface

This volume of case studies represents a sampling of Western Canada's experience with resource rent collection by governments during the 1970s and 1980s. A product of the Institute's Western Resources Program, the book covers six resource industries: nickel in Manitoba; potash and uranium in Saskatchewan; hydro-electricity in British Columbia and Manitoba; the forest industry in British Columbia; and the Pacific salmon fishery.

Notably excluded is the petroleum industry, which is the subject of a companion volume to be published shortly. That study will compare rent collection in oil-producing jurisdictions around the world, including Alberta and the Canada Lands.

Further work on British Columbia's forest industry has also being undertaken by the Institute, again as part of the Western Resources Program. The focus there is on softwood lumber, in the context of the recent United States countervail action in which the issue of economic rent collection has figured prominently, and the concerns for soverignty in resource policy have been underlined dramatically.

On behalf of the Institute, I wish to acknowledge the financial support received from the Government of Canada and the Manitoba Energy Authority in aid of the research leading to this edited collection. Also, I would like to express my thanks to Eric Kierans for the thoughtful and provocative reflections which this book suggested to him. While the authors of this volume very properly have constrained themselves to produce as objective and disinterested a research report as possible, Eric Kierans, as befits an elder statesman and Institute Fellow, has underlined some of the political judgments and cultural values that may be at stake for us in the pricing and management of both renewable and exhaustible resources. While one may quarrel with his conclusions, there is no doubt that we are dealing here with some fundamental features of public policy which will challenge us for years to come. The present volume of research papers is intended to provide empirical and institutional background which may help in formulating policies to meet that challenge.

Rod Dobell
President

February 1987

Préface

Ce volume, qui réunit des études de cas, a été préparé dans le cadre du programme de recherche de l'Institut sur les ressources de l'Ouest. Il rend compte de l'expérience accumulée par l'Ouest du Canada en matière de perception des revenus sur les ressources naturelles, au cours des années 70 et 80. Six industries primaires sont étudiées ici : le nickel du Manitoba, la potasse et l'uranium de la Saskatchewan, l'hydro-électricité de la Colombie-Britannique et du Manitoba, la forêt de la Colombie-Britannique et les pêcheries de saumon du Pacifique.

On remarquera que l'industrie pétrolière en a été exclue. Elle fera l'objet d'un autre volume, à travers le monde, y compris en Alberta et dans les Territoires canadiens.

Dans le cadre de son programme sur les ressources de l'Ouest, l'Institut a également entrepris des recherches sur l'industrie forestière de la Colombie-Britannique. On y examine principalement la question du bois d'oeuvre, dans le contexte de la récente dispute avec les Etats-Unis sur le problème des compensations, qui a permis de mettre en lumière les difficultés que soulèvent le système de perception de la rente économique et la souveraineté nationale en matière de ressources naturelles.

Au nom de l'Institut, je désire exprimer ma gratitude au Gouvernement du Canada et à l'Autorité de l'énergie du Manitoba, pour leur contribution financière à la recherche qui a permis la présente publication. Je désire également remercier Eric Kierans de ses réflexions profondes et stimulantes au sujet de ce même ouvrage. Alors que les auteurs se sont efforcés d'être aussi objectifs et neutres que possible dans la rédaction de leur rapport de recherche, Eric Kierans, comme il sied à un homme d'Etat chevronné et à un chercheur émérite de l'Institut, insiste sur certaines des décisions politiques et des valeurs culturelles susceptibles d'être remises en question dans l'établissement des prix et de la gestion des ressources renouvelables et non renouvelables. On pourra ne pas tomber d'accord avec ses conclusions, mais on doit reconnaître qu'il s'agit ici de questions politiques fondamentales qui continueront de se poser à nous dans l'avenir. Le présent volume est destiné à fournir un cadre empirique et institutionnel utile à la recherche de formules politiques qui puissent répondre à ce défi.

Rod Dobell
Président

Février 1987

The Authors

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Summary

This volume's message is straightforward: it suggests that by pursuit of some aggressive reforms, Western Canadians, as owners of resources held by the crown, could receive substantially more economic value from the resource sector than they do now. In general, the argument is organized around three themes: maximization of resource rents; distribution of these rents; and political markets, the underlying political economy that influences how rent collection activity is organized.

Rent Maximization

After revenues from natural resources have been disbursed to pay all costs of production – including a return on investment, or "normal profit", equivalent to what could be earned in the next best use of the capital – any surplus remaining is "economic rent". This surplus indicates that total revenues are greater than the amount required to compensate all factors of production sufficiently to cause them to remain in their current use. Natural resource rents can arise because of the limited supply of resources, monopoly power and/or short-run market disequilibrium.

It is argued here that economic rent is the most appropriate measure of the contribution of natural resources to economic welfare, and consequently, the principal objective of natural resource policy should be to maximize rent. The case studies suggest various ways of doing this. First, regulations on resource

developers which attempt to achieve ill-defined objectives at the cost of forgone rent should be removed. Analysis of the British Columbia forest industry, for example, illustrates the costs of policies such as regulation of cutting and restriction on log exports. While there is justification for regulating resource industries to realize social goals, they should be pursued through explicit, accountable public policy not by means of an implicit *quid pro quo*. The costs and benefits of achieving the social goal then become more visible and easier to evaluate.

A second way of reducing the costs of production and thereby maximizing rents is to prevent development of surplus capacity. This is particularly difficult in the resource sector because projects are capital intensive and investor expectations often are inflated. Indeed, as the case studies of forestry, potash, hydro, and nickel illustrate, resource industries dissipate rents by excessive expansion during resource booms. While it is impossible to have perfect information about future markets, much improvement is possible. Removal of government subsidies which encourage uneconomic expansion is essential. Also, given the large-scale nature of resource projects, efforts should be made to coordinate resource investments to prevent individual producers from developing capacity to serve the same market. Indicative government planning to assess comprehensively supply and demand would be helpful. Uncertainty regarding future resource markets makes some frustrated expectations inevitable; but given past experience, policy makers need to err on the side of pessimism. The cost of forgoing possible benefits, due to capacity constraints during booms, can be substantially less than the costs of unused capacity and unemployed labour during slumps.

Policies to increase resource revenue have received less attention than policies to reduce cost. Producers such as OPEC have been successful in increasing petroleum rents by restricting output, while consumers such as the Japanese have been successful in appropriating rents by encouraging surplus capacity and using consortium purchasing. To realize market power or to counteract consortium buying, resource producers might be encouraged to band together to form their own oligopolies. For example, joint private/public marketing boards could be created for major commodities. These boards could undertake indicative planning to prevent surplus capacity as well as regulate production and marketing to realize market power. Richards' study of the Saskatchewan potash industry, for example, shows that policies to coordinate investment and regulate output could have increased potash rents by a factor of 4.5.

Rent Distribution

During the 1970s, Canadians engaged in major battles over the distribution of resource rents. Some observers dismissed economic rent as a concept invented by governments to justify their grabbing revenues from the resource sector. Certainly many of the initial rent-capture mechanisms put in place by government during the 1970s were hastily devised and generated inequities; they left sizeable rent with some producers, while reducing returns of others below normal. In some sectors the rent being fought over proved transitory. Given the lag between the appearance of the windfall and the government response, some public policies generated disappointing revenues while aggravating government-industry relations. This experience has fostered the view that given the current weak state of resource markets and the apparent trade-off between collecting rent and the quantity of rent generated, governments should restrict their efforts to simplifying regulations and reducing the tax burden.

The case studies in this volume suggest that this attitude is fundamentally misguided. The following table comparing potential rent and rent actually collected by government illustrates that there is substantial opportunity for increased rent collection. Admittedly, most resource markets currently are in a depressed state. As the history of resource markets shows, however, commodity prices are highly cyclical, and contemporary expectations based on current market conditions are a poor guide to future developments. Indeed, by restricting capacity, present curtailment of investment is increasing the probability for recovery in many resource markets. Given the length of time from the initial debate over new resource policy to its implementation, now is the appropriate time for a thorough policy review.

The case studies also illustrate that the trade-off between rent generation (efficiency) and rent collection (equity) need not be negative; it may well be positive. First, it is impossible to define efficiency independent of equity. A reallocation of income can shift the relative demand for different goods, change relative prices, and thus alter the definition of an efficient outcome (Dasgupta and Pearse 1974; Mishan 1975). Also, failure to collect rent can act as a subsidy which distorts prices and hence a firm's production decision. The subsidy allows firms to earn normal returns without due regard for costs (termed "X-inefficiency") and to retain within the sector income that could more productively be invested elsewhere (known as "allocative inefficiency"). Therefore aggressive rent collection can actually improve efficiency and, consequently, the amount of rent generated.

Estimate of Resource Rents in Selected Resource Industries (millions of 1985 $)

Industry	Annual Rent Collected by Government	Potential Annual Rent
Manitoba Nickel Industry	35	161-224
Manitoba Hydro	11	165
Saskatchewan Potash Industry (1964-1977)	-6	85-156
British Columbia Forest Industry	488	1,032-2,157
British Columbia Hydro	184	765-1,609
Pacific Fishery	3	83

Source: Case studies in this volume.

The study reviews four techniques that governments use to collect rent: royalties and taxes, competitive bidding, marketing boards, and public ownership. The appropriate choice of technique depends on the characteristics of the resource. In general, the more competitive the market is for the right to exploit a resource, the more appropriate it is to capture rent by competitive auction. The more uncertainty surrounding the net benefits to be generated, and the more important the oligopolistic tendencies among private producers, the greater the degree of public intervention and entrepreneurship needed. Since one rent-collection technique can often compensate for the disadvantage of another, a combination of techniques is desirable. Competitive bidding, for example, can be used in conjunction with royalties to collect residual rent. A crown corporation, meanwhile, can provide the information and bargaining power to government needed to make competitive bidding and taxation work. Competitive bidding and private sector competition in turn can force crown corporations to remain efficient.

Fishing and forestry are the only sectors from those included here in which competitive bidding could be effective. Greater market imperfections in other sectors require more interventionist approaches. Gunton, for example, argues that some direct public control of nickel production, through a mechanism such as a marketing board, is required to ensure rent generation commensurate with Manitoba's comparative advantage. Richards argues that public ownership of the entire potash industry is necessary in order for Saskatchewan to realize the potential benefits of its market power, while Anderson concludes that the present joint ventures between the public and private sector, combined with a rate of return royalty, are effective in the uranium industry. Bernard and Payne acknowledge the necessity of public ownership in the hydro sector and recommend ways of improving the performance of utilities. In order for public entrepreneurship to be effective, public corporations should be forced to compete with private ventures where competition is feasible; should be given a clear mandate to maximize rent; should be subject to close public scrutiny, through mechanisms such as bipartisan legislative committees; and should be required to pay a portion of their rent directly to the public, the ultimate owners of crown resources. Furthermore, care should be taken to ensure that public acquisitions, or public investments in joint ventures, are made at a price that is net of economic rent.

As important as the choice of technique is stability in its use. Resource firms must invest in physical plant and equipment specific to the resource sector, assets that have essentially no value outside the sector. If changing policies significantly increase what may already be a high level of uncertainty about future revenue, then firms will increase the discount rate they apply to future revenue projections and lower the rent they are prepared to pay for the right to exploit publicly owned resources. An analogous argument applies to workers in resource sectors who must invest in "specific human capital", namely skills specific to the industry. If public rent capture increases their uncertainty about employment, workers will demand a higher wage. Again the effect is to lower the potential for the public owners of the resource to capture rent. Policy lags are a related problem. A resource boom may stimulate government to devise new rent-collection policies that are implemented only after the boom has turned to bust. As a consequence, governments forgo potential rent during the boom and exacerbate industry problems during the slump.

Political Markets

Resource policy is beset by the problem of "diffused costs, concentrated benefits." The beneficiaries of public rent capture frequently are a diffused group of citizens (the public owners), while the opponents of public rent collection usually are highly concentrated groups, such as trade associations dominated by a few major companies. Improving resource policy is contingent upon citizens consciously exhorting government to promote the general interest in efficient resource management as a balance to interest group lobbying. If the benefits of efficient resource policy are transferred to the citizen in a transparent manner, he/she also will experience directly the costs of poor policies and will be more likely to oppose them. Therefore, it is proposed that a significant portion of resource rents should be distributed directly to citizens as a "resource dividend".

In addition, jurisdiction over resource policy ought to be as decentralized as economies of scale and efficient public management permit. Two offsetting factors deserve mention. The smaller is the population of the responsible jurisdiction, the larger the per capita cost of government hiring an efficient staff to manage and regulate the resource, and the more likely that the government scrimp on such costs. This factor implies that the efficiency of government intervention increases with the size of jurisdiction. Note, however, the per capita cost of inefficient public policy is larger, the smaller the political jurisdiction; and the larger the per capita stake, the more insistent will citizens be that government pursue rent-maximizing policies. Current constitutional practice, whereby provincial governments undertake most resource management, is probably more efficient than devolving resource jurisdiction to local government or centralizing it in the national government. Exceptions exist. Efficiency in the British Columbia forest industry may well be enhanced by decentralization of some management functions to subprovincial regions; in the case of nickel, a measure of interprovincial co-ordination between Ontario and Manitoba would increase aggregate Canadian rent from this resource.

Conclusion

Despite the problems associated with resource-based economies, the comparative advantage that Western Canada currently enjoys in resource products and the potential gains from improved management are so great that policy makers should be primarily concerned with rational resource management. For reasons of efficiency and equity, governments must give priority to the collection of resource rents. The authors acknowledge that efficient rent collection and rational resource policy are demanding tasks, fraught with decisions made under uncertainty and frequently acrimonious political bargaining. But abandoning those tasks assures an even less desirable future for all concerned.

C

Abrégé

Le message de cet ouvrage est sans détour : les Canadiens de l'Ouest, en tant que détenteurs de ressources naturelles de la couronne, pourraient obtenir beaucoup plus d'avantages économiques qu'ils n'en ont à l'heure actuelle, si des réformes audacieuses étaient entreprises. L'argumentation de cette thèse s'organise autour de trois thèmes : la maximalisation des revenus des ressources naturelles; la répartition de ces revenus; la réglementation des marchés, pour établir le contexte politique économique nécessaire à l'organisation de la perception des revenus.

Maximalisation des revenus

Après paiement de tous les coûts de production à partir des revenus des ressources naturelles – y compris la rémunération de l'investissement, ou "profit normal", équivalent au rendement du capital dans la meilleure des situations analogues – tout excédent constitue une "rente économique". Ce surplus indique que les revenus, dans leur totalité, sont supérieurs aux coûts du maintien de tous les facteurs de production dans leur emploi présent. Les revenus provenant des ressources naturelles peuvent être dus à la rareté des ressources, à une situation de monopole ou à un déséquilibre passager du marché.

Les auteurs de cet ouvrage cherchent à démontrer que la rente économique, ou revenu net, représente l'indice le plus approprié pour mesurer la contribution des ressources naturelles à la prospérité économique; aussi le principal objectif de toute politique en ce domaine devrait-il être la maximalisation des revenus. Les études de cas proposent divers moyens pour y arriver. En premier lieu, la réglementation au profit d'entrepreneurs mal équipés pour exploiter les ressources naturelles d'une façon rentable devrait être abandonnée. L'étude de l'industrie forestière de la Colombie-Britannique, par exemple, permet de se rendre compte du coût de mesures telles que la réglementation des coupes et les restrictions sur l'exportation du bois en grume. Quand une réglementation des industries de ressources naturelles s'impose pour le bien commun de la société, cela devrait se faire explicitement, par des mesures politiques responsables, et non pas au moyen d'un mécanisme implicite réciproque. Les avantages et inconvénients de la politique sociale recherchée deviennent alors tangibles et faciles à évaluer.

Une seconde manière de réduire les coûts de production, et par conséquent d'augmenter les revenus nets, est de prévenir le développement d'une capacité de production excédentaire. Ceci est particulièrement difficile à réaliser dans le secteur des ressources, parce que les projets demandent beaucoup de capitaux et que les espoirs des investisseurs sont souvent exagérés. En vérité, comme le montrent les études sur l'exploitation forestière, la potasse, la houille blanche et le nickel, les industries primaires gaspillent leurs revenus par des investissements inconsidérés dans les périodes de prospérité. Bien qu'il soit impossible de prévoir avec certitude l'évolution des marchés, une sage politique est quand même réalisable. Dans cette optique, la suppression des aides gouvernementales, responsables d'investissements mal avisés, est essentielle. En outre, étant donné l'envergure habituelle des projets d'exploitation des ressources naturelles, on devrait s'efforcer de coordonner la politique d'investissement, pour prévenir l'augmentation intempestive de la capacité de production de certains industriels privés. Il serait bon également que le gouvernement établisse, à titre indicatif, un planning de l'ensemble de l'offre et de la demande. L'incertitude quant à l'avenir des marchés de ressources naturelles rend inévitable la frustration de certains espoirs; pourtant, l'expérience nous a appris que ceux qui sont responsables des décisions politiques avaient besoin d'acquérir une certaine dose de pessimisme. Le manque à gagner, dû à une capacité de production insuffisante dans les périodes de boom économique, peut être largement moins onéreux que le sous-emploi du personnel et de l'équipement, durant les périodes de récession.

Les mesures destinées à accroître les revenus ont reçu moins d'attention que celles visant à réduire les coûts. Des producteurs, tels ceux de l'OPEC, sont parvenus à augmenter les revenus du pétrole en réduisant la production, alors que des consommateurs comme les Japonais ont réussi à économiser en encourageant les surplus de capacité et en mettant sur pied des consortiums d'achat. Pour se rendre maîtres du marché ou pour neutraliser les effets des consortiums d'achat, les producteurs des ressources naturelles pourraient être encouragés à former leurs propres oligopoles. Ainsi des offices de commercialisation réunissant les secteurs public et privé pourraient être créés pour les matières premières de majeure importance. Ces organismes pourraient établir des prévisions en vue d'éviter le surplus de capacité de production; ils pourraient également réglementer la production et la commercialisation pour se rendre maîtres du marché. L'étude de Richards sur l'industrie de la potasse en Saskatchewan montre qu'une telle politique aurait pu accroître les revenus de la potasse d'un facteur de 4.5.

Répartition des revenus

Durant les années 70, les Canadiens se sont engagés dans des querelles sérieuses au sujet de la répartition des revenus des ressources naturelles. Certains observateurs rejetaient le concept de rente économique comme un prétexte inventé par les gouvernements pour justifier l'imposition des redevances. Certes, dans les années 70, de nombreux systèmes de redevances ont été hâtivement établis et ont engendré des injustices; certains producteurs conservaient une part considérable des bénéfices, alors que d'autres étaient réduits à la portion congrue. Dans plusieurs secteurs, la présence de la rente fut transitoire. Du fait du décalage entre l'apparition de bons résultats et la réaction gouvernementale, certaines mesures politiques ont engendré des revenus décevants et aggravé ainsi les relations entre le gouvernement et l'industrie. Cette expérience a conduit à la conclusion que, étant donné la faiblesse actuelle des marchés des ressources naturelles et l'apparent rapport établi entre les redevances et le montant des revenus, les gouvernements devraient borner leurs efforts à simplifier les réglementations et à réduire le fardeau des taxes.

Les études de cas du présent recueil montrent que cette attitude est fondamentalement malencontreuse. Le tableau ci-après, qui compare les revenus potentiels et les redevances réellement perçues par le gouvernement, indique qu'il est très possible d'augmenter considérablement les redevances. Certes, la plupart des marchés de matières premières sont actuellement dans un stade de dépression; l'histoire de ces marchés prouve cependant que les prix des ressources naturelles sont essentiellement cycliques : les conditions présentes ne permettent donc pas de présager du futur. En fait, la diminution des investissements actuels, en réduisant la capacité de production, augmente les chances de redressement dans bien des marchés de ressources naturelles. Si l'on songe au temps qu'il faut pour mettre en vigueur une nouvelle politique, l'heure est venue pour une révision complète de la politique dans ce secteur.

Les études de cas montrent également que le rapport forcé entre la création de revenus et la perception de redevances n'a pas nécessairement un effet négatif. Il peut très bien être positif. En premier lieu, il est impossible de définir le rendement sans tenir compte des profits à distribuer. Une réaffectation des revenus peut changer la demande relative pour certains biens, affecter la relativité des prix et ainsi altérer la définition d'un résultat efficace (Dasgupta et Pearse 1974; Mishan 1975). De plus, le défaut de perception d'un revenu peut avoir l'effet d'un subside qui fausse les prix, et par conséquent les décisions relatives à la production de l'entreprise. Le subside permet aux entreprises de recevoir des revenus sans avoir une juste appréciation des coûts, et de retenir dans le secteur des revenus qui pourraient être investis ailleurs avec plus d'efficacité. On peut donc dire qu'une perception énergique des revenus est en fait susceptible d'accroître le rendement et donc le montant des revenus produits.

Evaluation des revenus dans certaines industries de ressources naturelles (en millions de dollars 1985)

Industries	Revenus annuels perçus par le gouvernement	Revenus annuels potentiels
Nickel du Manitoba	35	161-224
Hydro Manitoba	11	165
Potasse de la Saskatchewan (1964-1977)	-6	85-156
Forêts de la Colombie-Britannique	488	1,032-2,157
Hydro C.-B.	184	765-1,609
Pêcheries du Pacifique	3	83

Source : Etudes de cas dans ce volume.

L'étude examine quatre techniques de perception de revenus par les gouvernements : royalties et taxes, appels d'offres concurrentiels, offices de commercialisation, et propriété publique. Le choix de la technique est fonction du type de ressource naturelle. En général, plus le marché pour l'exploitation d'une ressource est concurrentiel, plus la technique de l'appel d'offres s'impose. Plus les revenus nets sont incertains, entraînant d'importantes tendances à l'oligopole parmi les producteurs privés, et plus il devient nécessaire que le secteur public intervienne et prenne l'initiative des opérations. Et puisque une technique de perception de revenus peut souvent compenser les désavantages d'une autre, et vice-versa, une combinaison de techniques est désirable. L'appel d'offres, par exemple, peut être utilisé concurremment avec les royalties pour recueillir des revenus résiduels. Une corporation de la couronne, d'un autre côté, peut fournir au gouvernement les données et la force de persuasion nécessaires à la réussite d'un appel d'offres ou d'un système de taxation. Par ailleurs, l'appel d'offres et la concurrence du secteur privé peuvent obliger les corporations de la couronne à rester efficaces.

La pêche et l'industrie forestière sont les seuls secteurs, parmi ceux mentionnés ici, pour lesquels l'appel d'offres pourrait être valable. De plus grandes imperfections de marché, dans les autres secteurs, rendent nécessaires des methodes plus interventionnistes. Pour Gunton, un contrôle gouvernemental direct de la production de nickel s'impose, au moyen d'un office de commercialisation, si l'on veut obtenir des revenus proportionnels à l'avantage comparé de la province dans ce secteur. Richards préconise la prise en charge par le gouvernement de la potasse de la Saskatchewan, pour réaliser le potentiel de ce marché, alors que pour Anderson, l'association des secteurs public et privé et l'établissement de royalties sur les profits représentent la formule efficace dans l'industrie de l'uranium. Bernard et Payne reconnaissent la nécessité de la propriété publique dans le secteur hydro-électrique et font des recommandations visant à améliorer la performance des services d'utilité publique. Pour que l'entreprise publique devienne efficace, on devrait, dans la mesure du possible, forcer les corporations publiques à entrer en compétition avec les entreprises privées, tout en leur imposant le mandat non équivoque de maximaliser leurs revenus; elles devraient également être soumises à un contrôle public précis, par exemple au moyen de comités législatifs bipartites, et être obligées à verser une partie de leurs revenus directement au public, ultime propriétaire des ressources de la couronne. En outre, on devrait veiller à ce que les acquisitions publiques, ou les investissements publics dans les co-participations, se fassent à un prix n'incluant pas la rente économique.

Le choix d'une technique particulière ne suffit pas, il faut s'y tenir. Les entreprises du secteur des ressources doivent investir dans des installations et du matériel particuliers au type de ressource, inutilisables en dehors de ce secteur. Si de nouvelles mesures politiques viennent sensiblement augmenter l'incertitude, relativement à l'avenir des revenus, les entreprises réagiront en accroissant le taux d'escompte de leurs revenus futures, et en diminuant la rente qu'elles sont prêtes à payer pour avoir le droit d'exploiter les ressources du domaine public. Le même argument se retrouve dans le cas des secteurs qui doivent s'assurer les services d'une main-d'oeuvre spécialisée, c'est-à-dire avec des compétences techniques propres à une industrie donnée. Si les redevances perçues par le gouvernement accroissent l'incertitude de l'emploi, les travailleurs demanderont des salaires plus élevés, ce qui, une fois de plus, diminuera les sources de revenu pour le domaine public. Les décalages dus aux mesures politiques sont un problème du même genre. Un boom dans l'industrie des ressources naturelles peut inciter le gouvernement à établir une nouvelle politique de redevances qui ne deviendra effective qu'après la retombée des prix, avec pour résultat de voir le gouvernement manquer l'opportunité de la période de prospérité et exacerber à contre-temps les problèmes d'une industrie en dépression.

Réglementation des marchés

La réglementation des ressources naturelles se heurte au problème des "coûts étalés et des revenus concentrés". Les bénéficiaires des redevances sur les ressources forment habituellement un groupe indéterminé de citoyens divers (les propriétaires du domaine public), alors que les opposants à la perception des redevances constituent fréquemment des groupes très homogènes, tels que les associations professionnelles dominées par quelques grandes compagnies. L'amélioration de la réglementation sur les ressources dépend de la pression exercée par les citoyens sur leur gouvernement, afin de l'obliger à promouvoir l'intérêt général, grâce à une gestion efficace de ce secteur, et malgré l'opposition des groupes d'intérêt privés. Si les avantages d'une politique efficace, relativement aux ressources naturelles, se répercutent sans ambiguïté sur le citoyen, il en sera de même des inconvénients d'une politique mal conçue, auquel cas le public réagira vraisemblablement en s'y opposant. C'est ce qui amène à proposer qu'un pourcentage important des rentes perçues par le gouvernement soit directement distribué au public, à titre de "dividende sur les ressources".

En outre, la juridiction sur la politique relative aux ressources naturelles devrait être aussi décentralisée que le permettent les économies de groupement et une saine gestion publique. Deux facteurs, à tendance opposée, méritent d'être signalés ici. Plus la population de la juridiction responsable est petite et plus les coûts per capita des personnels chargés de la réglementation et de la gestion deviennent lourds, ce qui, par voie de conséquence, rend le gouvernement de plus en plus hésitant devant de tels coûts. Il en résulte que l'efficacité gouvernementale augmente avec l'importance de la juridiction. Pourtant, d'un autre côté, le coût per capita d'une politique est d'autant plus grand que la juridiction est plus petite, et plus l'enjeu per capita est d'importance et plus les citoyens insisteront pour que le gouvernement agisse avec le maximum d'efficacité. La pratique constitutionnelle actuelle, qui donne principalement aux gouvernements provinciaux l'initiative de la gestion en matière de ressources naturelles, est probablement d'un meilleur rendement que le fait de laisser le soin de cette gestion aux autorités locales, ou encore que de la regrouper sous la juridiction du fédéral. Il existe cependant des exceptions. Le rendement de l'industrie forestière de la Colombie-Britannique pourrait être amélioré par une délégation de certaines opérations de gestion à des subdivisions régionales; dans le cas du nickel, une coordination inter-provinciale entre l'Ontario et le Manitoba augmenterait les revenus collectifs canadiens de cette ressource.

Conclusion

En dépit des problèmes posés par les économies axées sur les ressources naturelles, l'avantage relatif dont jouit actuellement l'Ouest du Canada dans l'exploitation des matières premières et les gains potentiels qu'on peut espérer retirer d'une gestion améliorée sont si grands que les responsables politiques feraient bien de porter leur attention sur l'organisation et l'administration des ressources naturelles. Pour des raisons d'efficacité et d'équité, les gouvernements doivent donner la priorité à la perception des revenus des ressources naturelles. Les auteurs reconnaissent qu'il n'est pas facile d'établir un système de redevances adéquat ni une politique rationnelle, en matière de ressources naturelles; les décisions doivent souvent être prises dans l'incertitude et fréquemment au cours de négociations très dures. Pourtant, une politique de laisser-aller aboutit à une situation encore moins désirable pour toutes les parties concernées.

Chapter 1:

Political Economy of Resource Policy

Thomas Gunton
John Richards

This volume's message is straightforward: it suggests that by pursuit of some aggressive reforms, Western Canadians could earn considerably more income from the resource sector than they do now. But, the sceptic may ask, is there additional income to be had? Is the future of Canadian resource industries not one of low prices and stagnant output? Clearly, the mid-1980s are a period of pessimistic expectations, especially when contrasted with those of the 1970s. The history of most resource sectors, however, shows that contemporary expectations are a poor guide to future developments. Indeed, by restricting capacity, present curtailment of investment is increasing the probability for recovery in many resource markets. Given the length of time which usually elapses from the initial debate over new resource policy to its implementation, now is the appropriate time to consider policy for the next upturn.

A good point of departure is Eric Kierans' 1973 report to the Government of Manitoba. It accused the mining industry of appropriating substantial "economic rent" – surplus income over and above normal returns to capital and labour. According to Kierans, this surplus income rightfully belongs to the public as owners of crown resources. (For a discussion of the concept of economic rent see the appendix to this chapter.) Kierans' style guaranteed controversy:

> The natural resources of Manitoba have great value. That wealth can be used to finance the growth and continuing development of Manitoba or it can be used to expand the power and financial strength of the exploiting corporations. It is this latter course that has been pursued. The migration of Manitoba wealth and the erosion of the provincial tax base means, in turn, the inevitable departure of people, their skills and their brains. (Kierans 1973, 49)

His recommendation to the government was "to place the responsibility for all future development of Manitoba's resources firmly in the hands of the public sector" (Kierans 1973, 49).

Although Kierans characterized his proposals as a pragmatic search "for the better way", resource firms interpreted them as a direct attack on the principle of private enterprise. Not surprisingly they launched a concerted counterattack ranging from minor criticisms of his statistics to an outright rejection of the theory of economic rent. Kierans' timing was remarkably adroit. Six months after its publication in early 1973, OPEC undertook an extraordinary action to collect resource rent – a fourfold oil price increase in the wake of war in the Middle East. During the first half of the 1970s, boom conditions prevailed in markets for many primary commodities: cereals, fertilizers, minerals, as well as hydrocarbon fuels. The result was a dramatic improvement in the terms of trade of Western Canada with the rest of the country and with the world. The size of windfall resource revenues broke decades of regulatory inertia and prompted provincial governments to increase royalty rates, enact new resource taxes, and even expropriate producing assets.

Following their initial enthusiasm, government leaders soon discovered resource rent to be a much more complex issue than they had anticipated. First came intense conflict over rent distribution. Western provincial governments made their claim as owners under the Canadian constitution of the public domain within their respective boundaries. The resource companies claimed much of the windfall as a legitimate return to their capital investment and expertise. The federal government made a double claim: the right to extract resource rent through its taxing powers and the right, flowing from the federal trade and commerce power, to set domestic resource prices below world levels, thereby acting as the agent of resource consumers desirous of capturing rent in the form of cheap prices.

Initial rent-capture mechanisms put in place by provincial and federal governments were hastily devised and generated many inequities; they left sizeable rent with some producers while reducing returns of others below normal. In some sectors the rent being fought over proved transitory. Therefore some government policies generated disappointing revenues while aggravating government-industry relations. This experience has produced a contemporary consensus among policy advisers that can be summarized as low expectations for growth in the sector, combined with cautionary advice to governments to simplify regulations and restrict taxation. A good illustration of this consensus is the Macdonald Commission recommendation:

> It is generally expected that average annual growth in demand for non-fuel minerals in the next two decades will run at less than half the rates attained since the close of the Second World War. Global structural changes and mineral substitution have left a legacy of surplus productive capacity that for Canada's non-ferrous metals may take five, ten or even more years to correct . . . In the minerals area, this Commission recommends that:
> * After collection of a minimum royalty, taxation be based on profit rather than output.
> * Canadians take a more realistic attitude towards the economic adjustments that will be necessary. . . .
> * Governments undertake a systematic review of their regulatory regimes with the intent of streamlining the process. (Royal Commission on the Economic Union and Development Prospects for Canada 1985, II, 479-480)

The danger is that this consensus could lure policy advisers into a passive stance of "deregulation" and divert their energies toward other more topical activities such as encouragement of "high tech" manufacturing. Despite the undeniable problems of resource-based economies, the comparative advantage that Canada, particularly Western Canada, enjoys in the primary sector is so large that public policy should continue to emphasize improvements in the efficiency of, and increases in the public rent capture from, resource industries. The six studies collected in this volume suggest substantial gains can be made by judicious reform. While the precise nature of the reform needed varies with each resource industry, this introduction attempts some generalizations, beginning with a discussion of the role of resources in economic development.

Staples, Rent and Growth

Canadian academic writers started from the obvious positive correlation between the level of income generated by a succession of dominant "staples" and total regional income. (See Richards 1985, for a more elaborate treatment.) Following G.W. Bertram, "staple" industries are those "based on agricultural and extractive resources, not requiring elaborate processing and finding a large portion of their market in international trade" (Bertram 1967, 75.). Bertram extends the concept of staples to include not only industries within the traditional bounds of the primary sector, but also "primary manufacturing". Primary manufacturing refers to activities, such as the production of pulp, in which the value added by manufacturing is low compared to the value of the staple input, or highly capital intensive activities, such as the production of simple petrochemicals, in which the staple is upgraded into a standardized, intermediate product. As the following table illustrates, staple industries are a significant component of Western Canada's economy.

A simple staple model of regional economic growth is a good reference point. Assume that a region possesses an abundant, low-cost supply of a natural resource and that the staple produced from it enjoys strong international demand. Also assume that economies of scale are important in manufacturing activities and that the region faces high transport costs to major markets. What are the implications for economic development? The high transport costs provide some protection against manufactured imports and enable some regional manufacturing to emerge, but simultaneously they deny regional manufacturers the ability to compete in export markets. Restricted to the local market, regional manufacturers cannot realize the same scale economies as manufacturers located near large concentrations of population. Conversely, despite having to absorb transport costs to export markets, regional staple producers may realize not only normal returns to capital and labour but also economic rent. Therefore to maximize regional per capita income, the region should specialize in staple exports and import its manufactured requirements.

The addition of "linkages" and "leakages" affords a rudimentary dynamic perspective. As recipients of income from the staple industry spend – workers their wages, capitalists their profits, and resource owners their rent – they create a second round of new income amplifying the income arising from the staple itself. This multiplier effect, or "final demand" linkage, continues indefinitely, although its ultimate impact is severely limited by "leakages" out of the regional economy – expenditures

Table 1
Distribution of Labour force, by Staple and Closely Linked Manufacturing, by Selected Regions, 1981
(percentage)

	Prairie Provinces	British Columbia	Canada
Staples[1]	15.9	8.3	8.1
Closely Linked Mfg.[2]	2.6	8.4	5.7
Total, direct	18.5	16.7	13.8
Indirect[3]	18.5	16.7	13.8
Total, staple induced	37.0	33.4	27.6
Other	63.0	66.6	72.4
Total	100.0	100.0	100.0

[1] Includes agriculture; forestry; fishing and trapping; mines (including milling), quarries, and oil wells; electrical-driven, gas and water utilities.

[2] Includes the following manufacturing activities; food, beverage (including food processing, flour milling); wood (including sawmills); paper and allied products; smelting and refining; petroleum and fuel products (including refining).

[3] The indirect staple employment arises from a multiplier of 2 applied to direct employment. This multiplier value is a conservative estimate drawn from a survey of the literature.

Source: Calculated from *Census of Canada* 1981.

on imported goods, savings, and taxes levied by the federal government. Over time new staple industries may also generate "backward" linkages, industries which expand to supply the staple sector, and "forward" linkages, industries which process the staple.

The policy conclusion from this staple model is: concentrate entrepreneurship on the development of export staples and closely linked industries for which the region enjoys a comparative cost advantage. The regional economy will diversify into secondary manufacturing, to the extent warranted, via one of the three linkage mechanisms.

A representative, early advocate of "staples as a catalyst for growth" is W.A. Mackintosh. In his classic economic history of Canada prepared for the Rowell-Sirois Commission (Royal Commission on Dominion-Provincial Relations), he was adamant that "rapid progress in . . . new countries is dependent upon the discovery and development of cheap supplies of raw materials by the export of which to the markets of the world the new country may purchase the products which it cannot produce economically at that stage of its development" (Mackintosh 1964, 13). Writing at the end of a decade of economic depression which had its most severe impact on the agricultural economy of the prairies, no one could be unambiguously sanguine about staple-led growth. He admitted that "incomes derived from the export of raw materials are notoriously variable" and summarized the central problems of any staple-based development as "those that occur when fluctuating incomes are coupled with the rigid expenditures occasioned by heavy debt charges" (Mackintosh 1964, 13).

Throughout Mackintosh's discussion of the problem of uncertainty and unrealized expectations in Canada's staple sectors is a tension between his appreciation of the need for aggressive risk-taking and borrowing of foreign capital in order to develop a new economy, and his recognition of the need to improve the quality of decisions by both public and private agents. The following observations by Mackintosh are as applicable to oil, gas, and coal in the early 1980s as to wheat in the 1930s:

> . . . rapid development is further dependent on the ability of a new country to borrow capital abroad and to adopt also technical knowledge and equipment developed in older countries. Without such borrowings and adoptions, progress is inevitably reduced to the slow pace of domestic accumulation of savings and the development of local inventions. . . .

> There is, under these circumstances, a strong and natural inclination on the part of a new country to borrow extensively and thus build up heavy debt charges. Since incomes derived from the export of raw materials are notoriously variable, the economic difficulties in which new countries so frequently find themselves are those that occur when fluctuating incomes are coupled with the rigid expenditures occasioned by heavy debt charges. When, as is so frequently the case, an attempt has been made to cheapen the cost of borrowing by lending the credit or guarantee of the government or by the government itself making the necessary expenditures for improvements, economic difficulties find their reflection immediately in the financial difficulties of government. Pioneers are by necessity and selection sanguine people. They are prone to take over-optimistic views of the effects of such community investment on future income and to assume that government guarantees may be given at no cost. (Mackintosh 1964, 13-14)

While Mackintosh was acutely conscious of problems with resource-based growth, his emphasis was reform: to improve the quality of public and private resource planning. The other classic analyst of Canadian staple development is Harold Innis. For Innis the staple theory was more than an export-led growth theory. It was a framework for analyzing the entire political, social, and economic history of Canada. Innis attempted to show how Canadian history has been shaped by the export of a succession of staples from the Canadian hinterland to metropolitan European and American markets. The process of staple development, to Innis, has not been benign: "Each staple in its turn left its stamp, and the shift to new staples invariably produced periods of crisis in which adjustments in the old structures were painfully made and a new pattern created in relation to a new staple" (Innis 1972, 5-6).

According to Innis, the imperial state dictated the pattern of staple development in its colonies, controlled the terms of trade and captured most of any rent arising. Citizens of a peripheral colony were forced to finance from their taxes much of the fixed overhead (such as railways, canals, roads) required to extract and transport the staple. The economy of a colony thus became "dependent" on continued exports of the staple to the imperial state. As Innis concluded:

> The economic history of Canada has been dominated by the discrepancy between the centre and the margin of western civilization. Energy has been directed toward the exploitation of staple products and the tendency has been cumulative . . . Agriculture, industry, transportation, trade, finance and governmental activities tend to become subordinate to the production of the staple for a more highly specialized manufacturing community. (Innis 1956, 385)

Innis inspired many contemporary critics of staple development such as Watkins (1963, 1973, 1977), Naylor (1975), Drache (1978), Britton and Gilmour (1978). These writers, whom we might label "neo-Innisians", have argued that past policy distorted the Canadian economy, excessively favouring development based on current comparative advantage in resources and closely linked sectors at the expense of an alleged potential to expand a broad range of secondary manufacturing activities.

If the technology of a staple industry is capital intensive, if it displays important scale economies and if the quantity of the newly discovered resource input is large compared to domestic savings of a "new" country, then recourse to imported capital becomes highly probable—especially if rapid growth is a high political priority. Many early writers viewed such a process benevolently, as a means of breaking down the parochial nature of regional economies and of integrating them into the world economy. However, according to the neo-Innisians, importing foreign capital impedes regional development. Externally controlled firms have a bias for locating supply industries, management, and research and development functions outside the staple-supplying region. Potential backward linkages also are underdeveloped because of the propensity of externally controlled firms to rely on their existing external suppliers even if competitive local suppliers exist. Resource rents necessary for regional capital formation are drained from the region through devices such as intra-company transfer pricing. Local entrepreneurship is inhibited by barriers to entry—such as lack of access to capital, technology, and markets—and therefore is deprived of the opportunity to learn by doing. Governments are hampered in their attempt to implement resource policy because they have a weak bargaining position vis-à-vis large multinationals which control the savings, investment, technology, and markets necessary for the functioning of the staple economy. In sum, the externally controlled staple economy can be locked into a "staple trap," as Watkins observes:

> At the root of our problem lies foreign ownership. In the resource industries, it means the export of staples in unprocessed form and the outward drain of surplus. In the manufacturing industries, it means a truncated, branch-plant structure with a high propensity to import parts and a demonstrated incapacity to export finished products, or even to hold the Canadian market without tariff protection. The combination is deadly (Watkins 1973, 115)

The existence of a staple sector, whether owned domestically or by foreigners, may engender a "rentier mentality" that has an adverse effect on the potential of the economy to evolve creatively. Watkins (1963) and Naylor (1975), for example, illustrate how domestic entrepreneurs become content to reinvest rental income into staple industries, shunning diversification into new sectors with higher risks but also higher expected returns. Trade unions within the staple sector may act similarly, erecting barriers to entry into the sector and thereby collecting a portion of rent in the form of inflated wages (Copithorne 1979). The example of a small, well-paid work force in the staple sector may provoke attempts to raise wages elsewhere in the economy. If non-staple workers succeed, a wage-push inflationary process may well arise as staple workers strive to preserve a differential. High wage costs in turn will lower export demand and cause balance of payments deficits. Local politicians, meanwhile, may acquiesce to the demand, by powerful employer and labour lobbies within the staple sector, that the state forgo public rent capture and subsidize new staple exports. The result is an economy mired in "staple dependence."

Mackintosh emphasized the successful implantation of staple export sectors as a necessary preliminary to linked manufacturing development—staples as necessary, although not sufficient, for future industrialization. For the neo-Innisians, staples are neither necessary nor sufficient. At best, staple-linked development produces a "dependent" industrialization that has a propensity to excessive foreign control of industrial assets, and in which only those sectors closely linked to the staple sectors flourish. The core of the neo-Innisian alternative is the channelling of domestic savings into a domestically owned manufacturing sector. Necessary to the alternative is government protection to encourage import substitution. The defence of such intervention is based ultimately on the infant industry argument, the potential for Canadian firms to learn by doing.

The problem with the neo-Innisian position is that it assumes that staple development leads inexorably to a dependent economy. Only by denying the significance of the wheat boom can one conclude that Canadian industrial development prior to World War I was totally distorted. A great deal of manufacturing investment occurred (Bertram 1967), and the evidence of merchant opposition to industrial diversification is dubious (Macdonald 1975). Similarly, the mineral resource boom in Western Canada after World War II has certainly generated higher income levels than would have an equivalent level of investment in manufacturing. Such a conclusion need in no way deny that the first generation of political and business leaders responded to the post-war boom in a manner warranting a charge of "dependence". But the passivity of the first generation did not persist (Richards and Pratt 1979).

Nor does it follow that the alternative of indigenously owned manufacturing and import substitution will be exempt from analogous problems. Despite examples of successful autarkic development, the economic literature is replete with case studies which demonstrate the failure of many national development strategies heavily biased toward secondary manufacturing and economic self-sufficiency. A rentier mentality, analogous to that potentially circumscribing staple development, may arise in a manufacturing sector operating behind protective barriers. Both capitalists and workers within such a sector may display an inertia debilitating to the overall economy while capturing a disproportionate share of investment funds, skilled labour, and public services.

Finally, the validity of the neo-Innisian position – that indigenous manufacturing is superior to staple development – is a question of limited interest for Western Canada. Western Canada *did* develop a staple-based economy and now faces the challenge of managing it properly.

In summary, the neo-Innisian contribution is not its blanket condemnation of resource development, but rather its emphasis on the potentially adverse impact of foreign investment upon the ability of domestic agents to undertake entrepreneurial decisions. Even here one must qualify. Foreign-owned firms at times improve Canadian productivity by importing superior technology (Globerman 1978).

Turn now to the seminal work of Chambers and Gordon (1966). An important question in each of the case studies in this volume is the potential of the resource industry in question to generate economic rent. Determination of the magnitude of any such rent is obviously an empirical exercise, but our argument implies that such income is substantial. Many economists have argued that is not the case. Much of their conviction derives from Chambers and Gordon's ingenious model of the Canadian wheat boom, which attempted to measure the rent generated at its height, during the first decade of the century.

In the simplest version of their model, Chambers and Gordon considered an immigrant arriving in Montreal as having two basic options: manufacturing or farming. They assumed all capital to be borrowed from abroad at a fixed price; thus profit and interest income accrued to foreigners. They further assumed that Canada, a small country, could export and import within the relevant range whatever quantities it desired of wheat or manufactured goods without affecting international prices. The final assumption was constant returns to scale in both farming and manufacturing. Competition implied the equalization of wage rates across sectors as workers migrated to maximize income. In the case of farming, tenant farmers earned the prevailing wage, but the income of homesteaders was divided into two components: the wage income they could earn in alternative employment and rent. Under these assumptions, the effect on national income of the immigrant's choice reduces to the size of any agricultural rent.

Chambers and Gordon then posed a hypothetical question: "What would have happened if all the [prairie] land that was brought under cultivation between 1901 and 1911 had been impenetrable rock?" (Chambers and Gordon 1966, 317). The immigrants' occupational choice would have been restricted to that of wage earner. The manufacturing sector could have expanded to absorb all these frustrated farmers at constant prices, labour productivity, and wages. Apart from a trivial loss of tariff revenue on manufactured imports displaced by enlarged domestic production, the only effect on per capita Canadian incomes would have been the lost agricultural rent. This, they estimated, was merely 8.4 per cent of the observed per capita income increase of Canadians between 1901 and 1911.

The two theoretical conclusions from this model are: the wage level for a small country possessing both a staple export sector and a manufacturing sector subject to net imports depends on manufacturing productivity alone and is entirely independent of the resource endowment; and the benefit derived from a natural resource endowment is the rent generated, which is likely to be small relative to other factors affecting growth of per capita income.

Chambers and Gordon were correct in insisting that rent is the appropriate measure of the value of a staple sector. They also deserve credit as the first to conduct an empirical exercise measuring rent under the realistic assumption that labour and capital would be reallocated in the absence of the resource. It is important to realize, however, that their calculation of a small amount of rent follows from the particular set of assumptions in their model. Although his own analytic treatment was flawed, Lewis (1975) emphasized perhaps the most serious analytic weakness of the Chambers and Gordon model, namely its trivialization of the demand side analysis. The model adopts the small country assumption of international trade theory. Under that assumption, Canada faced an infinitely elastic demand at fixed international prices (plus the tariff where relevant) for the commodities it bought and sold. The small country assumption *is* reasonable for wheat, a homogeneous commodity of which many European industrial countries had become net importers. In the absence of prairie land, Canada might have become a net exporter of manufactured goods and an importer of grain. But international markets for manufactured goods are less competitive than those for homogeneous primary commodities, and the export demand for Canadian manufactures should be assumed to be of finite elasticity (i.e. downward sloping).

The hypothetical exercise of reducing available prairie land now results in complex shifts in the supply of, and demand for, labour in the two sectors. In general, as the number of farmers declines, some displaced farmers are absorbed in manufacturing. But the manufacturing sector only can expand by lowering the prices of Canadian-manufactured goods and the prevailing wage. To the extent these goods are produced and consumed within Canada, a decline in their price merely redistributes income from industrial workers to Canadian consumers; to the extent they are exported, the benefits of the price decline are shared with the rest of the world.

In summary, hypothetical elimination of prairie land now lowers per capita Canadian income levels for three reasons: (1) as before, lost agricultural rent; (2) a decline in average output per farmer, resulting from the wage decline which, in turn, lowers the opportunity cost (foregone benefit of manufactured goods when labour is employed in agriculture) of homestead labour and induces substitution of labour for land in wheat production; and (3) a negative terms of trade effect due to the decline in the price of manufactured goods exports. The result of all this is that rent is larger than Chambers and Gordon allow.

The significance for policy debates of Chambers and Gordon's model extends well beyond any inquiry into the prairie wheat boom. Their conclusions have been enthusiastically taken up by, among others, the Economic Council of Canada. In an Economic Council study on regional per capita income disparities in Canada, Copithorne (1979) concluded that differences in resource endowments explain little of the variation. Copithorne's theoretical basis is Chambers and Gordon. He insists "that a region's general wage level is determined in its non-primary trading [i.e. manufacturing] sectors, quite independently of the size and quality of its natural resource endowment" (Copithorne 1979, 13). He assumes scarcity or "differential" rent to be unimportant in most cases. (See appendix for discussion of rent concepts.) He further assumes that most Canadian resource industries—the British Columbia forestry as a significant exception—are operating at optimum levels of competitive efficiency, and therefore provide little potential to generate rent by improved managerial efficiency. Finally, he assumes that the high elasticity of supply, by producers beyond any provincial government's jurisdiction, would frustrate attempts to generate monopoly rent by curtailing production to increase price.

While these assumptions were necessary for the type of macro-level analysis undertaken by Copithorne, they can lead to a serious underestimate of rent. The detailed case studies in this volume illustrate that with more realistic assumptions regarding managerial efficiency and exercise of market power, rent estimates increase dramatically. Richards' study of potash, for example, shows that increased efficiency could have multiplied the potash rent generated over the 1964-1977 period by a factor of 2.5. A judicious exercise of market power—combined with increased efficiency—might have multiplied rent over the period by a factor of 4.5. Gunton's analysis of nickel illustrates that with improved management Manitoba nickel rents could have been 2.5 times larger.

In summing up this section, two points can be made. First, serious pitfalls to staple-led growth exist, but they must be compared to analogous problems posed by alternative strategies. Second, the appropriate measure of the significance of any resource sector is not the proportion of resource-related income to total regional income, but a careful empirical measure of such a sector's ability to generate rent compared to that of the best alternative employment of labour and capital. The case studies show that the resource sector's rent potential is substantial.

Political and Economic Markets: Dual Arenas

If failure to implement optimal resource policies results in the public forgoing substantial rent, why are such policies pursued? This question is usefully addressed by contrasting "political" and "economic" markets.

Political Markets

For many purposes it is useful to think of the political process as a market in which groups bargain for gain, just as they do in private economic markets. Political markets differ obviously from economic markets; each has its strengths and failures. Competition can occur within each market: different firms competing against each other for sales, Ottawa and the provinces competing over the provision of a public service. But competition can also occur between the markets: representatives of private market institutions—firms, unions, etc.—attempting to extend their respective scope or politicians attempting to extend the scope of political decision making. Over time the boundary between political and economic markets slowly shifts as a function of general ideological preferences among citizens in a society. In most Western industrial countries, the 1980s have been dominated by a neo-conservative critique of political market failure, and some reallocation of functions to private economic markets has ensued.

An elegant and simple statement of the idea of competing political and economic markets is by Breton, writing in the Macdonald Commission:

> . . . there are, not one, but two broad arenas in which people seek to obtain the things which increase their well-being: markets and governments. Markets, when they are well-structured and competitive, do a good job over the longer term in allocating resources in ways that maximize the well-being of the population. That is a generally accepted proposition and one in which I strongly believe. What is less accepted, but an idea in which I nonetheless believe just as strongly, is that governments, when they are well-structured and competitive, do as good a job as markets, and like them over the longer term, allocate resources in ways that maximize the well-being of people. (Royal Commission 1985, III, 522)

The dynamics of political markets can best be understood in terms of "diffused costs, concentrated benefits". Interest groups weigh the costs of bargaining in terms of money and time against the expected gain (size of gain times probability of success). Expected benefits must exceed the costs before bargaining occurs. For several reasons successful interest groups tend to restrict their membership and define narrow goals. First, the costs of a lobby rise with the number in it. Second, the narrower the aim, the lower the cost of reconciling potentially divergent aims among members of the lobby. Third, large size brings with it the problem of controlling "free riders" who, while not contributing actively to the lobby goal, cannot easily be denied a share in the benefits. A lobby is less likely to provoke opposition if the costs of realizing its goals can be diffused over a large number of people for whom formation of a counter-lobby is prohibitively costly. Consequently, the likely outcome is policies that confer concentrated benefits on narrow interest groups in return for diffused costs borne by a large population. Simple as it is, this theory permits an understanding of much of the bargaining in the resource sector (Olson 1982).

In the resource sector potentially important lobbies include citizens of the resource-owning political jurisdiction, government bureaucrats, owners and workers in resource firms, and consumers of the resource. Citizens, as owners of natural resources, have an obvious interest in pursuing efficient resource policies to maximize rent. However, they are unlikely to be an effective lobby for rent maximization because the incremental rent generated by good management is small in per capita terms and may not be immediately accessible or visible to individual citizens.

Democratically elected governments are agents of the citizens and should have the same interest in efficient resource management. Government bureaucracies are, however, complex entities with their own internal dynamic. Public bureaucrats, for example, may have their own set of interests, such as expansion of income, security and power (Niskanen 1971; Breton 1974). This implies that a public bureaucracy may want to expand its power and size without alienating powerful interest groups which could threaten its security. As a result, a public agency may serve the specialized private interests which consume its services (Bernstein 1955; Jordan 1972; Richards and Pratt, 1979). For example, while bureaucrats in central planning ministries may want to maximize public rent collection, public servants closely engaged in resource management may oppose vigorous rent collection on the grounds that such policies would harm interests within the resource sector they are managing.

In Canada, the role of government is further complicated by competition over natural resource jurisdiction between federal and provincial governments. Both Ottawa and resource-producing provinces can interpret particular clauses of the *Constitution Act* (*British North American Act* renamed) in support of their respective initiatives to regulate resource industries. Some ambiguity has been resolved by an amendment to the *Constitution Act* (Section 92A) which in effect overrode the two key Supreme Court decisions limiting provincial resource jurisdiction (Meekison, Romanow and Moull 1985).

A third set of participants in the bargaining process are owners of resource firms and workers within those firms. As Table 2 illustrates, resource industries tend to be highly concentrated. The costs of effective collective action by the owners of these few firms is relatively low, and consequently one would expect that in many industries the owners constitute a powerful lobby that controls investment, production, and much specialized information. If organized into one or a few unions, workers within resource firms may also be an effective lobby able to appropriate rent through inflated wages.

The final significant participants are consumers, who hope to appropriate rents by obtaining resources at discounted prices. Because they are a diffuse group, consumers are unlikely to lobby effectively to appropriate rents – unless the price effect is substantial, they reside in the jurisdiction that controls the resource, and the cost of any price cut is borne by some other diffuse group (as is the case if consumers lobby against themselves as owners of resource-based crown corporations). Among our case studies, hydroelectric power is the only sector in which consumers constitute an effective lobby.

Recent experience in resource policy

A prominent economic historian (Aitken 1959) characterized Canadian economic policy as the promotion of economic growth by subsidized infrastructure and unrestricted access to natural resources. Canadian politicians have never, in his opinion, placed public rent maximization as a high priority. These case studies provide a good deal of evidence that he is right. Schwindt documents the British Columbia government's promotion of development by allocating timber reserves to private interests for nominal charges. Bernard and Payne discuss provincial takeover of hydroelectric power in Manitoba and British Columbia as a means to stimulate development with cheap power. Gunton shows that Manitoba was willing to provide generous concessions to obtain development of its nickel resources. Richards observes that, during much of the post-war period, the Saskatchewan government was willing to trade off potential rents in favour of rapid, private development. Admittedly, in each case governments did charge royalties. But because of special provisions available to the resource sector, such as depletion, the proportion of profit paid as income tax was, prior to 1973, less than for manufacturing. (Canada, Energy Mines and Resources 1982, 48)

Table 2
Concentration Ratios,*
Mining and Resource Processing - 1980

Industry	Concentration Ratio (percentage)	Number of Enterprises	Value of Shipments (millions of $)
Gold Quartz Mines	94	16	696.7
Uranium	100	6	722.5
Iron Mines	98	9	1,872.7
Nickel-Copper-Gold-Silver	91	18	4,572.1
Silver-Lead-Zinc Mines	94	17	1,007.9
Coal Mines	97	17	913.3
Asbestos Mines	100	6	655.6
Potash Mines	100	6	1,046.3
Iron & Steel Mills	90	39	6,431.5
Smelting and Refining	93	17	3,273.2
Aluminum Rolling & Casting	93	59	1,049.3
Petroleum Refining	85	16	14,255.8
Logging	34	3,073	4,559.3
Sawmill & Planing Mills	30	1,180	5,278.2
Pulp and Paper Mills	49	60	10,907.6

* Per cent of value of shipments accounted for by eight largest enterprises.

Source: Schwindt 1986, 121

During the late 1960s and early 1970s, the strategy of low resource taxation came under criticism. The Carter Commission, in its comprehensive review of the Canadian tax system, called for the elimination of many concessions enjoyed by extractive industries, terming them inequitable and inefficient (Canada 1966). In Ontario, the Smith Committee used the concept of rent to justify imposition of special royalties on the resource sector (Ontario 1967). And in his analysis for the Manitoba government, Kierans argued that if governments did not collect rent, multinational firms would leak it from the province, thereby impeding regional economic development (Kierans 1973).

Combined with the commodity boom in the early 1970s, the reversal of opinion on the obligations of government to capture resource rent precipitated significant changes in government policy. Between 1969 and 1975, the government of Manitoba initiated a series of reforms—an innovative royalty system, a crown corporation to undertake exploration and development of new mineral deposits, a significant tightening of leasing regulations, and a compulsory joint venture scheme. Although moderate compared to Kierans' proposal for "nationalizing" the industry, cumulatively these changes were fundamental. In Saskatchewan the government pursued similar reforms including creation of a crown mineral corporation to engage in exploration; tightening of lease requirements; introduction of new royalty systems for rent capture in oil, uranium and other industries; and from 1976 to 1978, takeover of nearly one-half the assets of the provincial potash industry. A primary motivation for this last initiative was uncertainty over the constitutionality of rent capture by less interventionist means. Between 1972 and 1975 the government of British Columbia implemented a new mineral royalty, launched a major royal commission on reform of forestry management and acquired several major firms in the forestry sector. Although the primary motive for acquisitions was to preserve employment in single-industry towns threatened by mill closures, government leaders were also acting to increase public control of the major provincial resource industry. Elected in 1971, the Alberta Conservatives became acutely conscious of the magnitude of windfall rents created by post-1973 oil and gas price increases, rewrote their royalty legislation and resorted to the use of crown corporations as an instrument to collect resource rent. The federal government also showed increasing interest in resource rents. In 1972 Ottawa increased its resource taxation by legislating some of the Carter Commission reforms. As oil prices rose in 1973, Ottawa simultaneously acted as agent for oil consumers by controlling domestic prices and competed with the oil-producing provinces to capture the windfall rents. The climax of Ottawa's interest in rent collection came in 1980, with the battery of new taxes, new regulations, and nationalization of private assets contained in the National Energy Program.

It is obviously rash, however, to conclude from this history the existence of some consistent process whereby provincial and federal politicians learned the intricacies of resource rent collection and improved their policies accordingly. A more accurate, if more pessimistic, conclusion is that public rent collection policy is subject to complex cycles that permit policy to approach the optimum (if such a notion has meaning) only very slowly. The magnitude of windfall resource rents in the 1970s was sufficient to break the regulatory inertia in all provinces and Ottawa, but by the time new taxes and royalties were in place, rents in many resource sectors had disappeared. Boom had become bust. Lobbies within resource industries then blamed, with partial justification, their economic woes on new government initiatives to capture rent. Public support for government rent capture waned as investment, employment, and profits diminished in the resource sector.

Such was the fate of British Columbia's 1974 policy of "super royalties" applied to minerals. Public opposition to the province's resource policies contributed to the electoral defeat of the government in the 1975 provincial election. A newly elected Social Credit government eliminated the controversial mineral royalty, sold off the former government's acquisitions in the forest sector and abandoned the process of increasing the public share of forest rents. Opposition by lobbies within the resource sector was sufficiently intense that these policies might have been abandoned regardless of the outcome of the 1975 election (Payne 1979). A more dramatic example of lags in political response is the federal National Energy Program (NEP). Ottawa undertook this initiative only after the second round of OPEC price increases in 1979, seven years after the first round. By the time NEP initiatives were in place, the 1982 depression had begun and real oil prices were falling. Lobbies within the oil industry blamed NEP for the industry's frustrated expectations and, particularly in Western Canada, succeeded in discrediting the idea of rent capture by the federal government. In 1985, the federal government abandoned the NEP and used the "Western Accord" to transfer substantial energy rents back to producers. In mining, meanwhile, a major federal policy paper concluded there to be little rent in the sector and that attempts to capture it would reduce incentives to invest and distort production decisions by established producers (Canada, Energy Mines and Resources 1982, 54).

The policy cycle can produce more complex results. Consider the case of Manitoba. Resource lobbies criticized the province's rent-capture policies, launched by the NDP in the early 1970s, and blamed them for frustrated expectations in the middle of the decade. This critique contributed to election of a new Conservative government in the 1977 provincial election; but by the time the new government relaxed resource taxation, the provincial resource sector was experiencing a new boom. In 1981 the NDP regained office. But given the lags in devising policy and the uncertainty of future resource markets, this government has shied away from new initiatives to increase public rent capture.

Despite the furore over public rent collection initiatives, the proportion of rent – actual or potential – captured by government has frequently been modest (see Table 3). Gunton concludes that the Manitoba government obtained less than 15 per cent of the potential rent from its nickel industry. Richards' figures imply that, over the initial development phase from 1964 to 1977, federal and provincial governments combined earned negative rent from the Saskatchewan potash industry. The provincial government garnered a positive rent, but this was more than offset by the federal subsidy to the industry in the form of corporate income taxes at a rate far below the norm for Canadian industry. Schwindt's analysis of the B.C. forest industry suggests that the provincial stumpage system collected much less per unit of wood fibre than a competitive bidder would be prepared to pay. Bernard and Payne conclude that the Manitoba and British Columbia governments forgo up to $154 million and $1,425 million respectively in annual hydro rents, while Schwindt concludes that federal fisheries policy has been designed with virtually complete disregard of the problem of rent dissipation in this the quintessential common property resource. Anderson concludes that Saskatchewan's royalty regulations for uranium were relatively efficient at public rent capture – in part because the provincial cabinet, under attack on the propriety of uranium development, was anxious to demonstrate the potential for rent from the industry.

The evolution of resource policy supports the hypothesis that the dynamics of political bargaining seriously impede the ability of governments to pursue effective resource policy. A large proportion of rents are either retained by user groups or dissipated in various production inefficiencies.

Table 3
Estimate of Resource Rents in Selected Resource Industries (millions of 1985 $)

Industry	Annual Rent Collected by Government	Potential Aggregate Annual Rent
Manitoba Nickel Industry[1]	35	161-224
Manitoba Hydro[2]	11	165
Saskatchewan Potash Industry[3]	-6	85-156
British Columbia Forest Industry[4]	488	1,032-2,157
British Columbia Hydro[5]	184	765-1,609
Pacific Fishery[6]	3	83

Source: See case studies in this volume.

[1] Based on five-year period 1977-1981.

[2] Based on fiscal year 1982-1983. Revenue is water power rental.

[3] Based on years 1964-1977. Calculated net of a tax opportunity cost. See Richards' article in the volume for details of calculation.

[4] Based on estimates by Percy (1986) for the year 1979.

[5] Based on fiscal year 1982-1983. Rent collected is from the water rental tax.

[6] Based on 1982 harvest. Rent collected is licence fee revenue.

The "failures" of political and economic markets

Many economists conclude from the kind of analysis and evidence discussed above that political markets are inherently subject to "failure" – to serious inefficiencies compared to economic markets. Provided that the government does not erect barriers to the entry of new producers and defines appropriate private property rights, most economists probably would argue that most resource markets achieve most of the efficiencies obtained from perfect competition.

Norrie and Percy (1982) provide a good example of the tenor among contemporary economists. They assess the impact of a boom in the oil and gas sector in Alberta. Under hypothetical assumptions they determine the effect on a number of summary statistics (such as per capita Alberta GDP) arising from a one per cent energy price rise. Under the base case ("classic staple boom") private agents own the reserves and capture all incremental rent. In the long run, allowing for interregional migration of labour and capital, their model predicts a per capita Alberta GDP rise of .11 per cent. They then consider three options for provincial government intervention: (1) fiscally induced migration – government captures resource rent, taxes capital and disburses the revenue via a fiscal dividend to all residents, regardless of length of residence; (2) expansion of public sector output – government captures resource rent, taxes capital and uses this revenue to finance expansion of public sector output; (3) like the second option, but government also insulates provincial primary manufacturing sector from the energy price rise. Under these options a one per cent energy price rise induces, in the long run, changes in Alberta per capita real GDP ranging from 0 per cent to -.05 per cent. By extracting the incremental rent from private owners of energy reserves, the provincial government can indulge in "province-building". By a combination of distortion of factor prices and direct purchase of public sector output, the government expands, relative to the classic staple boom, the size of the provincial economy. But government intervention, facilitated by collective ownership of oil and gas reserves, introduces a degree of "tragedy of the commons". Under any of the three options for government intervention, per capita provincial income is below that in the classic staple boom.

Norrie and Percy explain the pursuit of rent-dissipating strategies in terms of "concentrated benefits, diffuse costs":

> . . . the owners of immobile factors, particularly urban land, tend to benefit from the extensive growth such

> strategies generate.... The benefits are disproportionately captured by a small group, giving them the incentive to lobby for their implementation and maintenance. The costs, in the form of allocative inefficiencies, are too diffuse to elicit much active opposition. Because of this, much of the economic rent produced by the Western energy boom ends up dissipated through resource inefficiencies and excessive immigration. (Norrie and Percy 1982, 55-56)

The policy conclusions of such economists are unremittingly conservative. After cautiously designing a tax regime to capture some rent, political agents should restrict themselves to working out the intricacies of "privatization"–the definition of a set of transferable private property rights that permit private agents to internalize all costs and benefits arising from their decisions with respect to resource exploitation. Implicit is the assumption that private economic agents base their decisions on rational expectations about the future, rational in the sense that they are formed from agents' independently making use of all available information about future outcomes. It follows logically that if political agents have the same objective function as their private counterparts, if they both have access to the same information about future outcomes and include the same costs and benefits in their respective calculations, then in theory the same net income would be realized.

This tradition of analysis–"public choice" economics–downplays traditional arguments about failure in private markets and, to the extent it acknowledges the existence of such failures, frequently opposes political intervention on the grounds it will make matters worse.

The reasons for market failure have been defined fairly precisely by economists, and are worth summarizing. A market fails when one or more firms can exercise monopoly power, restricting output and raising prices. A market also will fail when either the buyer or seller lacks known information, and it is costly to gain the relevant information. This information failure can refer to a miner who unwittingly incurs an occupational hazard known to his employer, or to a government agency that alienates crown mineral rights without acquiring available geological information. Markets for public goods fail. "Public goods" (such as the results of geological exploration) are distinguishable from "private goods" (such as an extracted mineral) in two ways: use of the good by one agent does not limit its use by another; and the creation of effective private property rights that limit access to the goods to a private owner is costly or impossible. Because of the difficulty in capturing the benefits therefrom, market agents typically produce too little of such goods. Markets also fail when economic activities generate external costs or benefits not borne by the contracting parties. A final source of market failure is the inherently hard to define matter of equity, particularly equity in the allocation of income. There is absolutely no guarantee that market economies produce a socially acceptable income distribution.

The resource sector – with markets characterized by oligopoly, long horizons, externalities, common property resource problems, high information costs, etc. – is particularly prone to market failure (Peterson 1977). In unregulated private markets, firms will underinvest in exploration because much of the benefit, increased geological knowledge, cannot be sold but instead "leaks out" to third parties. Uranium producers overdevelop the industry because they do not have to bear all the potential costs such as disposal of radioactive waste. In unregulated markets fishermen overharvest stocks because, acting individually, a fisherman cannot capture the benefits on future stock levels of his self-restraint. Forest companies pollute fish spawning streams because the costs on the fishery are not borne by them.

Even were it feasible in theory to "privatize" all these resources by the definition of some appropriate set of transferable private property rights, the political costs of allocating the rights and forcing compliance with them would, in many instances, be prohibitively costly. Continued and extensive government resource regulation is cheaper and more efficient. This is not an apologia for the status quo; much improvement is possible.

Consider further the issue of equity. People may want to trade some aggregate income in order to approach a particular (presumably more egalitarian) income distribution. Provincial governments have violated contracts with resource firms on maximum royalties, redrafted tax laws and "provincialized" resource assets in order to capture for the public sector more of the incremental revenue arising from the 1970s resource boom. The federal government has undertaken similar interventions. Governments have acted, in part, to capture rents for residents of their respective jurisdictions; they also acted because windfall rents that otherwise would have accrued to shareholders of resource companies were deemed to increase the inequality of income distribution by more than a democracy should tolerate. For a majority of citizens more "fairness" of income distribution justified government intervention and outweighed the costs of inefficiencies created within the resource sector.

Let us turn to the issue of managerial competence. The case studies in this volume suggest that agents in private markets dissipate rent. Gunton concludes, for example, that operating costs and capacity in Manitoba's nickel industry were much higher than necessary. Richards emphasizes that group-sanctioned bullish expectations among private potash firms in the 1960s were the cause of protracted overcapacity in the industry. Schwindt concludes that private management of the British Columbia forestry industry has not minimized costs. Many of these firms waited until the recession of the 1980s, when profit margins were constrained by low demand, to realize significant productivity gains.

These observations illustrate that a private firm is a complex organization which cannot be described (any more than can government) as pursuing one identifiable goal, profit maximization for the owners (Baumol 1966; Morris 1964; Leibenstein 1966; Williamson 1974). Like their public counterparts, private managers have substantial leeway to pursue their own goals—such as sales growth, staff expansion, and higher salaries—independent of the profit maximization goal of shareholders. The result has been both "X-inefficiency" (the gap between potential and actual output with a given quantity of inputs) and "allocative inefficiency" (the difference between the value of output produced by inputs in their present as opposed to their best alternative use).

One reason these problems are particularly acute in resource industries is the presence of rent nominally accruing to the crown. If government policy is lax in claiming rent, then it becomes a cushion for inefficiency, a subsidy that allows labour and capital in a resource industry to earn normal or above normal returns without serious attention to efficiency. These case studies provide ample evidence of managers' inefficiently expanding capacity or employment, the costs of which are borne by the citizen in the form of reduced public rent capture. Although government aggravates the problem by imposing ill-defined social goals on resource firms in exchange for alienating crown rights to exploit resources, the conclusion is clear: governments' failure to collect rent can increase inefficiencies in the resource sector.

Effective Resource Policy

Previous sections have emphasized that substantial gains can be made by better management of the resource sector. But what constitutes "good management"? At a general level, good public resource policy maximizes some social welfare goal which, in turn, is a function of aggregate rent (the sum of both present and future rent, appropriately discounted), its "fair" distribution, and stability of output, employment, and revenue. Statements at such a level of generality, however, are essentially tautological; what follows is an attempt to define more specifically how resource policy can be improved.

Rent maximization

A key objective of natural resource policy should be to maximize resource rents. One way to achieve this objective is by reducing resource development costs. Regulation of resource developers which attempts to achieve ill-defined social objectives by forgoing rent should be removed. Several recent studies of the British Columbia forest industry, for example, have emphasized the costs of policies such as export restrictions on logs and regulation of cuts (Percy 1986). Studies of the mining industry discuss costs resulting from exploration obligations and processing requirements (Kierans 1973). While there is justification for regulating resource industries to realize social goals, such goals should be pursued through explicit public policy not through implicit *quid pro quo*. For example, instead of increasing employment in the B.C. forest industry by banning log exports, the government could provide direct subsidies to domestic log processing. The costs and benefits of achieving the social goal would become more visible and easier to evaluate. Admittedly, by making subsidies transparent, we lower the cost to our trading partners of justifying countervailing protection against our forest exports.

A second way of reducing costs is to prevent development of surplus capacity. This is a characteristic problem of the resource sector because of the capital intensity of projects (capital cannot be reallocated once invested). Indeed, as the case studies of forestry, potash, hydro, and nickel illustrate, resource industries dissipate rents by excessive expansion during resource booms. While it is impossible to have perfect information regarding future markets, much improvement is possible. In general, public subsidies of resource investment is a poor means to stimulate employment. More indicative planning would be useful. Such planning involves government influencing the decisions of individual producers by comprehensively assessing supply and demand, and seeking to reconcile producer expectations of one another's intentions. Finally, the persistent "manic" expectations identified by Mackintosh, among others, must be dampened. Uncertainty regarding future resource markets makes some frustrated expectations inevitable, but given past experience, policy makers need to err on the side of pessimism. Forgone benefits due to capacity constraints during booms can be substantially less than the potential costs of unused capacity and labour during slumps.

Policies to increase resource revenue have received less attention than policies to reduce costs, despite growing evidence that prices can be influenced by producers or consumers. Producers such as OPEC have been successful in increasing petroleum rents by restricting output, while consumers such as the Japanese have been successful in appropriating rents by encouraging surplus capacity and using consortium purchasing. To realize market power or to counteract consortium buying, resource producers should be encouraged to act collectively. For example joint private/public marketing boards for major commodities could undertake indicative planning to prevent surplus capacity as well as regulate production and marketing. Richards' study of the Saskatchewan potash industry, for example, shows that policies to coordinate investment and regulate output would have substantially increased potash rents.

Rent Distribution

It is often alleged that government efforts to collect rent cause distortions such as "high grading" which reduce the quantity of rent generated. (For a discussion of such problems see the Appendix to this Chapter). Consequently it is argued that aggregate rent can be increased by reducing public rent collection. To suggest such a trade-off between efficiency and public rent collection is misleading. First, it is impossible to define efficiency independent of equity. A reallocation of income to different people can shift the demand for different goods, change prices and thus alter the definition of an efficient outcome (Dasgupta and Pearse 1974; Mishan 1975). Second, governments' failure to collect rent can act as a subsidy which distorts prices and hence a private firm's production decisions. This subsidy allows firms to earn normal returns without due regard for costs (X-inefficiency) and to retain income within the sector, income that could more productively be invested elsewhere (allocative inefficiency). Aggressive public rent collection could improve efficiency and, consequently, the amount of rent generated.

The Appendix reviews four techniques for collecting rent: royalties and taxes, competitive bidding, marketing boards, and public ownership. The choice of technique depends on the unique characteristics of the resource sector. In general, the more competitive the market is for the right to exploit a resource, the more appropriate it is to capture rent by competitive auction. The more uncertainty surrounding net benefits to be generated, and the greater the importance of oligopolistic tendencies among private producers, the greater must be the degree of public intervention and entrepreneurship. Since one rent-collection technique can often compensate for the disadvantage of another, use of a combination of techniques is desirable. Competitive bidding, for example, can be used in conjunction with royalties to collect residual rent. A crown corporation, meanwhile, can provide the competition, information, and bargaining power to government to make competitive bidding and taxation work. Competitive bidding and private sector competition in turn can force crown corporations to remain efficient.

In these case studies, fishing and forestry are the only sectors in which competitive bidding could be effective. The extent of market imperfections in other sectors is such that more interventionist approaches are required. Gunton, for example, argues that some direct public control of nickel production through a mechanism such as a marketing board is required to ensure rent generation commensurate with Manitoba's comparative advantage. Richards argues that public ownership of the entire potash industry is necessary for Saskatchewan to realize the potential benefits of its market power, while Anderson concludes joint ventures between the public and private sector, combined with a rate-of-return royalty, are effective in the uranium industry. Bernard and Payne acknowledge the necessity of public ownership in the hydro sector and recommend ways of improving the performance of utilities. If public entrepreneurship is to be effective, public corporations should be forced to compete with private ventures where feasible, given a clear mandate to maximize rent, subjected to close public scrutiny through mechanisms such as bipartisan legislative committees, and be required to pay a portion of their rent directly to the public. Furthermore, care should be taken to ensure that public acquisitions or public investments in joint ventures are made at a price net of rent.

Just as important as the choice of the technique is stability in its use. Resource firms must invest in physical plant and equipment that has essentially no value outside the sector. If changing policies significantly increase what may already be a high level of uncertainty about future revenue, then firms will increase the discount rate they apply to future revenue projections and lower the rent they are prepared to pay for the right to exploit publicly owned resources. An entirely analogous argument applies to workers in resource sectors, who must invest in specific "human capital", skills of limited value to employers in other sectors. If public rent capture increases employment uncertainty, workers in the sector will demand wages higher than in alternative employment. Again the effect is to lower the potential for public rent capture. Policy lags are a related problem: a resource boom may stimulate government to devise new rent collection policies that are implemented only after the boom has become bust. Governments forgo potential public rent during the boom and exacerbate industry problems during the slump.

Improving Political Markets

Implementation of market reforms depends on political reforms. As a balance to interest group lobbying, there is a need to strengthen the general interest in efficient resource management. One such reform is to distribute a significant portion of publicly captured resource rents directly to citizens as a "resource dividend". If the benefits of rent-maximizing resource policy are received by the voter in a transparent manner, he will experience directly – via a lower dividend – the costs of poor policy, and be more likely to oppose it.

In addition, jurisdiction over resource policy should be as decentralized as economies of scale and efficient public management permit. Two offsetting factors deserve mention. The smaller the population of the responsible jurisdiction, the larger the per capita cost of government hiring an efficient staff to manage and regulate the resource, and the more likely that the government scrimp on such costs. This factor implies that the efficiency of government intervention increases with the jurisdiction's population. Note, however, that the per capita costs of inefficient, public policy are larger, the smaller the political jurisdiction; and the larger the per capita stake, the more insistent will citizens be that government pursue policies that maximize resource rent. Current constitutional practice, whereby provincial governments undertake most resource planning, is probably more efficient than devolving public resource planning to local government or centralizing it in the national government. Exceptions exist. Efficiency in the British Columbia forest industry may well be enhanced by decentralization of some management functions to subprovincial regions. In the case of nickel, a measure of inter-provincial co-ordination between Ontario and Manitoba would increase aggregate Canadian rent from this resource.

One consequence of decentralization is inter-regional inequity in the distribution of resource revenue (Economic Council of Canada 1982). Despite extensive discussion of the issue (Scott 1976; Scott and Helliwell 1981; Economic Council of Canada 1982) there is little agreement on appropriate revenue sharing principles. Two offsetting factors are central to the debate. Retention of rents by provincial governments stimulates "fiscally induced migration" which can lead to an inefficient geographic distribution of labour (Breton 1976; Economic Council of Canada 1982; Norrie and Percy 1982). On the other hand, retention of rents by the federal government vitiates provincial property rights and destroys the incentive that increasing per capita benefits provide to a province to adopt rent-maximizing public policy. While some interesting resolutions to this trade-off have been proposed (see Helliwell and Scott 1981), no consensus exists – either among academics or politicians.

Conclusion

Despite the problems associated with resource-based economies, the comparative advantage that Western Canada currently enjoys in staples and the potential gains from improved management are so great that policy makers should be more concerned with rational resource management. For reasons of efficiency and equity, governments must give priority to the collection of resource rents. Efficient rent collection and rational resource policy is admittedly a demanding task, fraught with decisions made under uncertainty and political bargaining. But abandoning the task assures a less desirable future for all concerned.

Appendix – Rent and Rent Collection

> Mines, as well as land, generally pay a rent to their owner; and this rent, as well as the rent of land, is the effect, and never the cause of the high value of their produce.
>
> If there were abundance of equally fertile mines, which any one might appropriate, they could yield no rent; the value of their produce would depend on the quantity of labour necessary to extract the metal from the mine and bring it to market.
>
> But there are mines of various qualities, affording very different results, with equal quantities of labour. The metal produced from the poorest mine that is worked, must at least have an exchangeable value, not only sufficient to procure all the clothes, food, and other necessaries consumed by those employed in working it, and bringing the produce to market, but also to afford the common and ordinary profits to him who advances the stock necessary to carry on the undertaking. The return for capital from the poorest mine paying no rent, would regulate the rent of all the other more productive mines. This mine is supposed to yield the usual profits of stock. All that the other mines produce more than this, will necessarily be paid to the owners for rent.
>
> David Ricardo, *Principles of Political Economy and Taxation*

This appendix analyzes more fully some issues discussed in the text, beginning with a discussion of rent and followed by an assessment of alternative instruments for rent collection.

Economic Rent

The first economist to analyze rent systematically was David Ricardo. After earning his fortune speculating in government securities at the time of the Battle of Waterloo, he retired to the country and wrote his classic *Principles of Political Economy and Taxation* in which, among other topics, he addressed the issue of rent, "that compensation, which is paid to the owner of land for the use of its original and indestructible powers" (Ricardo 1971, 92).

Ricardo's model of rent had two assumptions:

1) The supply of natural resources for the production of primary (resource-related) goods is restricted by the

natural limits of the earth's endowment. Units of the resource – particular farm lands, fishing grounds, ore bodies, etc. – will differ in productivity and in the amount of labour and capital required to produce a unit of the good.

2) Competitive market conditions obtain for the supply of the other inputs – labour and capital – which define their "normal" returns independently of the resource sector. Following Malthus, Ricardo believed the natural price of labour to be "that price which is necessary to enable the labourers, one with another, to subsist and to perpetuate their race, without either increase or diminution" (Ricardo 1971, 115). Ricardo treated return to capital as a residual, the income left after subtraction of wages and rents.

Imagine all ore bodies capable of producing a particular mineral are ranked in terms of decreasing productivity or, what is equivalent, increasing cost of labour and capital, per unit of mineral produced. The level of demand will determine the "marginal mine", the least productive ore body worth operating. For it, the cost of capital and labour required to produce a unit equals the market-clearing price. On the marginal mine no rent occurs; on any intramarginal mine, rent will accrue to the mineowner equal to the difference in its productivity and that of the marginal mine.

Often designated "differential rent" (see Figure 1-A.), such rent can be substantial, as Gunton shows in his analysis of the Manitoba nickel industry.

The first elaboration is to allow for the existence of monopoly within resource markets. Ricardo was acutely conscious that owners of a natural resource may be able to increase rent by a judicious exercise of power in the market in which the primary good is sold. This they will accomplish by some combination of restriction of customer access to alternate cheaper sources of supply (for example, foreign suppliers) and collusion to restrict their own output. Ricardo scathingly attacked the English landed aristocrats who exercised political power by restricting imports of cheap foreign grain. As a result, demand for domestically produced grain increased, market price rose, less productive land was drawn into production (i.e. costs increased for land on the margin) and rent increased on intramarginal land. (The process is illustrated in Figure 1-B).

Ricardo's example illustrates that monopoly and differential rent are intimately related ideas. The controversy surrounding Canadian lumber exports to the United States provides a contemporary example. The central goal of the lobby within the United States seeking protection against Canadian exports is to raise the domestic United States price of lumber sufficiently to realize "normal" returns on the capital and labour employed in lumber firms in the states of the Pacific Northwest, in other words to realize a price that permits these relatively high cost firms to become the "marginal producers". Provided price is increased, it is of secondary importance to them whether the increase is achieved by Congress imposing a tariff on imported Canadian lumber or by Canadian governments (federal and provincial) agreeing to increase levies on Canadian lumber producers. The differential rent arising from intramarginal production in, say, British Columbia can only be defined in conjunction with the political process determining the relevant marginal production. Finally, the means of price increase is important in determining the distribution of rent – between governments and industry, and between the two countries.

A second elaboration is to consider time explicitly. If the supply of any resource is limited, and if we wish to maximize some measure of social welfare that includes future as well as current consumption, then efficient resource use requires that current price include a "user cost", a measure of rent to force current consumers to take account of the intertemporal effects of resource use (Scott 1955). For example, were all rent eliminated from crude oil prices and only the lowest cost Saudi Arabian reserves exploited, the price would be in the order of $3-4 per barrel. Some portion of the difference between the current price of oil and $3-4 reflects monopoly returns to the OPEC cartel; some other portion reflects an appropriate rent that improves intertemporal allocation efficiency by curtailing marginal current consumption.

A final complication is the idea of "quasi-rent" which arises from the distinction between short and long run costs. In the long run, market price must be sufficient to cover both short run (variable or operating) cost plus long run (capital replacement) cost. It is tempting to identify the difference between price and variable cost as rent (see Figure 1-C) because, in the short run, supply may be forthcoming from a firm at any price above variable cost. In the short run, capital cannot be reallocated. In the long run, however, if rewarded at less than the market rate, capital can be reallocated. To the extent the difference between price and variable cost comprises the necessary return to capital, it is a "quasi-rent". To tax quasi-rent impairs long run efficiency.

A related point is windfall profits that arise from unanticipated increases in demand. In the short run, inelastic supply means that an unanticipated increase in demand will cause a rise in price and above-normal returns to producers. If the shift in demand persists, changes in the level of capital investment may, in the long run, remove above-normal returns. In the short run, taxation of windfall profits need not impair efficiency. The difficulty lies in identification of a major windfall – post-1973 oil price rises, for example – from short-term fluctuations in demand that do not warrant any change in resource taxation.

Methods of Rent Collection

Effective rent collection by governments is clearly essential, both for reasons of efficiency and equity. This section introduces and assesses a variety of alternative instruments for rent collection.

Taxation and royalties

The most popular means of collecting rent are various forms of taxes and royalties. All forms share common characteristics. Taxation places government in the role of passive landlord collecting rent while leaving management of the resource to a private firm. The advantage is that government need not make complex management decisions; the disadvantage is that government may lack information to bargain effectively. Managers of the resource firm may hide profits by intra-company transfer pricing and, if the expertise to manage the particular resource is scarce, they may obtain monopoly returns by threatening an investment strike.

Regardless of how it is designed, a royalty system cannot collect all rent without affecting the quantity of rent generated. In practice it is difficult to distinguish between rent and normal returns to factors of production. Most royalties impinge on normal returns as well as on rent, thereby discouraging investment and creating other distortions. These potential distortions, however, may be more than offset by forcing firms to raise productivity to earn satisfactory profits, thereby overcoming the problem of "X-inefficiency." Even if the royalty system can guarantee normal returns to labour and capital, it tends to transform resource firms into regulated utilities with limited incentives to be efficient. Productivity gains accrue to government as rent payments, not to shareholders, managers, and workers as increased returns. In response, "X-inefficiency" may decrease.

Property tax
Property tax is normally levied as a percentage of the value of the site. Site valuation can be based on different methods including net present value of the mineral reserve, book value or depreciated book value of capital expenditures, or market value of comparable sites (Church 1981). The effect of property taxation depends on the characteristics of the resource and the valuation method. If site value is a function of invested capital or present value of the reserve, property tax increases the rate of extraction beyond the socially optimal (Burness 1976; Conrad and Hool 1980). Because this is a time-dependent form of taxation, it is advantageous to economize on the projected lifetime of a mine by accelerating production. In the long run, the property tax can reduce resource output by increasing costs of production (Bush 1972; Peterson 1978).

Lease fee
Holders of public resource rights are often required to pay an annual fee to the government per unit of leased land. In addition, leaseholders are normally required to undertake minimum levels of activity to retain their lease. The effect of such fees is similar to that for property taxes. They increase the rate of extraction, discourage exploitation of marginal resources and fail to capture significant rent on intramarginal sites (Jenkins 1977). However, these fees are usually token payments with minor effects on the firm's decision.

Output taxes
A third type is a royalty based on either volume of output (volumetric royalty) or value of output (ad valorem royalty). As Anderson points out in his discussion of the Saskatchewan uranium royalty, the principal advantages of this form are the relative short run stability of revenue raised, the relative ease of administration and, as a corollary, the difficulty of evasion by the producing firm. Disadvantages of output taxes include high-grading of deposits and under-investment in marginal projects (Burness 1976; Peterson 1978; Conrad and Hool 1980; Gillis and Bucovetsky 1978). (See Figure 2-A.) The actual effect depends on the characteristics of particular deposits and extractive technologies. One study of prospective mineral deposits, based on hypothetical data, showed that an ad valorem royalty reduced output substantially (MacKenzie and Bilodeau 1978). Another study, of the five per cent ad valorem royalty used in British Columbia in 1974-1976, concluded the impact on output to be substantial, but the efficiency cost to be minimal because rent on

the low grade deposits not extracted due to the royalty was small (Helliwell 1978; Bradley, Helliwell and Livernois 1981). And these distortions may be more than offset by reductions in "X-inefficiency", discussed above.

Income tax
A fourth type of levy is the income-based royalty, a percentage of profits. This is the approach used to extract nickel rents in Manitoba and in the base metal industries in most other provinces. Unlike the output levies, it is based on ability to pay. By reducing the fixed nature of government rent collection, income-based royalties impose less of an impediment to investment (Conrad and Hool 1980). Nonetheless, because an income-based royalty does not distinguish between normal profit as a required return to capital and rent, it is incapable of capturing a large share of rent on intramarginal deposits without discouraging marginal production (Kay and Mirrless 1975; Peterson 1978; Cairns 1985). (See Figure 2-B.) The efficiency cost of this is small, unless the rate is very high or it is difficult to order extraction of the deposit in terms of diminishing productivity (Helliwell 1978).

Other disadvantages of an income-based royalty are instability of revenue generated and collection difficulty because it requires detailed financial data from the producing firm and costly verification by government (Chambers 1976). For example, Inco's nickel mine in Manitoba sells primarily to another division of the company. Inco can legitimately lower its tax liability by allocating some portion of head office and research and development expenses to the Manitoba operation. How is the government to verify such intra-company pricing? Saskatchewan potash producers frustrated the provincial government's attempt to capture windfall rents by means of the potash reserve tax, a crude income-based royalty. Producers collectively refused to disclose detailed corporate accounts. This encouraged the government to consider the more radical means of takeover.

Rate-of-return royalty
The levies discussed so far do not distinguish fully between profits as normal returns to capital and rent. They tax normal profit, reducing output on marginal reserves while failing to capture all the rent on intramarginal deposits. An attractive alternative which in theory avoids these distortions is a rate-of-return royalty. Such a levy applies only to profits above a normal return to capital. It can be designed in different ways. One

formula, used in the Saskatchewan mining industry, is to apply the royalty on a forward value[1] basis (Garnaut and Clunies Ross 1975; White 1978; Anderson, this volume). When the forward value of revenues less allowed expenditures (appropriately weighted to reflect the date of accrual) turns positive, all subsequent cash flow to the mine is rent, and it is taxed at some specified rate. Alternatively, the royalty could be based on more traditional accounting techniques involving the amortization of capital expenditures instead of full deduction at the time of occurrence. This was the approach used in the Manitoba mining royalty from 1975-1978. The advantage of the amortization approach is that government earns some revenue from the levy before the forward value turns positive. The British Columbia forest stumpage system is often portrayed as a rate-of-return royalty, but it is not. It is calculated as a function of sales revenue plus a risk factor, without explicit account of a normal return to capital.

Because it is neutral and does not distort producers' after-tax relative to pre-tax costs, there is substantial theoretical support for rate-of-return royalties (Church 1981; Garnaut and Clunies Ross 1975, 1979, 1983). (See Figure 2-C.) As well, rate of return royalties reduce downside risk to producers, which further encourages optimal private investment levels. These potential advantages may be significant (Mackenzie and Bilodeau 1979). Anderson, meanwhile, shows that the scheme is both administratively practical and effective as a source of government revenue.

Practical limitations do, however, exist. Rate-of-return royalties require more detailed financial data than any other royalty system. They are particularly subject to problems of intra-company pricing (Jenkins 1977). Also, difficulty arises in determining a normal, risk-adjusted return to capital to use in forward valuation of producer expenditures. If the allowable rate is set above the private discount rate for the industry, rent will be forgone by the crown and the capital/labour ratio will be increased beyond what is socially optimal; if set too low, investment will be discouraged (Olewiler 1978). And the rate of tax on income deemed to be rent is relatively high, with rent retained by the firm from improvements in efficiency correspondingly low. This gives little incentive to the producer to be efficient, since most of the costs of inefficiency can be passed to the government in the form of lowered payments under the rate-of-return royalty (Jenkins 1977; Copithorne et al. 1985; Cairns 1985). Schwindt suggests this is a major problem of the British Columbia stumpage system.

An alternative to conventional rate-of-return royalties is the cash flow tax. The government receives a specified portion of any positive cash flow or contributes a specified portion of any negative cash flow. In essence, the government is operating as a partner, obtaining a share of profits based on its share of investment in the early negative cash flow phase of a project. The alleged advantages of this tax are that it is administratively simple; it eliminates the need for defining appropriate discount and depreciation rates, and it is neutral (Boadway et al. 1982; Copithorne et al. 1985). But such a tax would still require regulations to distinguish between cash flow from the projects for which negative cash flows are not shared and from new investments subject to tax. The administrative advantages may be small, and governments would be required to invest large sums without any rights of management while recovering only a portion of rent.

Competitive bidding

An alternative strategy for public rent collection is to auction the public rights to exploit the resource to the highest bidder. In theory this is an administratively simple strategy that captures all rent and causes none of the distortions of relative prices associated with royalties and taxes (Mead 1977; Petersen 1977). The firm simply bids an amount equal to the net present value to it of the site:

$$\text{Bid} = \sum_{t=1}^{N} \frac{R_t - C_t}{(1 + r)^t}$$

The higher the stream of expected revenues less costs ($R_t - C_t$) over the project lifetime (N) the higher the bid. Efficient firms expecting higher revenues and/or lower costs will outbid less efficient firms expecting lower net benefits. Thus the strategy encourages efficient resource exploitation.

While studies of the forest industry (Haley 1980; Schwindt, this volume) and of the oil and gas industry (Mead 1977; Watkins 1975; Watkins and Kirby 1981) tend to confirm these advantages, there are problems. The bidder must make a point estimate of future costs and revenues, including government tax policy. Given the high uncertainty surrounding any such estimate, the bidder will use a high discount factor (Peterson 1977; Oren and Williams 1975). Uncertainty can be lowered by delaying the auction until detailed exploration has been undertaken to provide accurate geological details and by soliciting bids not in cash, but in terms of the size of some variable parameter such as share of profits to be paid the crown. Nonetheless, because governments as sovereign bodies can at any time rewrite royalty contracts, bidders must judge the probability of forced recontracting. A government with a record of frequent policy revision will receive heavily discounted bids. Competitive bidding, to be successful, requires stable public policy.

A second problem with bidding is that it assumes bidders behave competitively. Some industries, such as forestry, may be competitive enough; others are too concentrated for competitive bidding to function. A high degree of concentration at a later stage of production, as in mineral processing, may transfer rent to that stage and away from the bidding market (Cohen and Krushinsky 1976). Furthermore, cash bidding may reduce competition by imposing high front-end costs which smaller firms with severe debt constraints cannot incur (Richards and Pratt 1979; Mead 1977; Cairns 1985). Finally, bidding is limited to resources which are not already allocated. Few resources meet this criterion.

Marketing boards

A third strategy for public rent collection is to set up a marketing board which purchases output from producers at a price covering all costs (including a normal profit) and resells it at market price. This strategy gives government some control over production and investment decisions; the government can manage the resource to exploit potential market power and, hopefully, to avoid the inefficiencies of surplus capacity. Marketing boards improve the potential for rent collection by strengthening the resource owner's information base and bargaining power. The history of marketing boards in the petroleum and agricultural sectors shows they are capable of achieving these objectives. Gunton argues in his nickel study that a marketing board would be an effective instrument for the Manitoba government.

The principal objection to marketing boards is that they are too effective in generating monopoly power for producers in an industry. This, however, may be an advantage if the resource is exported and the objective is to maximize rent for the resource-owning jurisdiction. Marketing boards also face some of the same problems associated with taxation. Should the price paid by the board to producers reflect the costs of the most efficient, or a typical, producer; and how are these costs to be determined?

Public ownership

A fourth strategy for rent collection is that government undertake production and marketing of the natural resource via a crown corporation or a joint venture. Some observers advocate this strategy as cutting through the Gordian knot posed by the alternatives (Kierans 1973; Richards and Pratt 1979; Cohen and Krushinsky 1976). Public ownership, it is argued, eliminates the distortions in incentives to private agents by giving the resource owner direct control over production and marketing. Rents can be collected as the surplus of the crown corporation without the losses caused by complex regulations and tax systems and without much of the pressure from private sector lobby groups to enfeeble the public rent collection process. Public ownership also allows the resource owner to develop more of the "footloose" linkages, such as research and development, which would otherwise be at the private producer's head office.

Bernard and Payne's study of hydro in this volume illustrates that public ownership is not without problems. Like their private sector counterparts, crown corporations have a tendency to dissipate rent through excess capacity, high operating costs, and rapid rates of exhaustion, especially when not constrained by competition from private sector firms. Crown corporations may be particularly vulnerable to political demands for current investment and job creation and to bureaucratic processes of self-aggrandizement. If the staple is domestically consumed, citizens may claim rents in the form of low prices (which encourage excessive consumption and favour the large consumer), as opposed to the potentially more efficient and equitable transfer of crown corporation surpluses to government revenue. With low prices, benefits are immediate and transparent. The alternative may provide the citizen with more of a public service he does not value or increase the potential for dissipation within the public bureaucracy. In addition, to avoid controversy at the time of setting up a crown corporation, governments may compensate the owners of expropriated private assets at prices that capitalize some expected future rent (Richards and Pratt 1979). Despite these drawbacks, as the case studies of potash, nickel, uranium and hydro show, public entrepreneurship is an essential component of an effective resource policy.

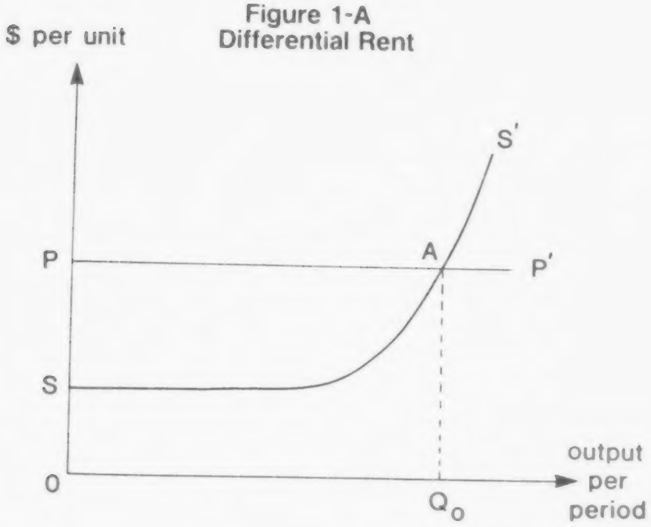
Conclusion

Each technique for rent collection has strengths and weaknesses which vary depending on the characteristics of the resource sector. Appropriate rent collection techniques therefore cannot be specified in abstract; they must be designed for each particular resource industry. Also, alternative techniques should be used in combination since they often compensate for each other's deficiencies.

Notes

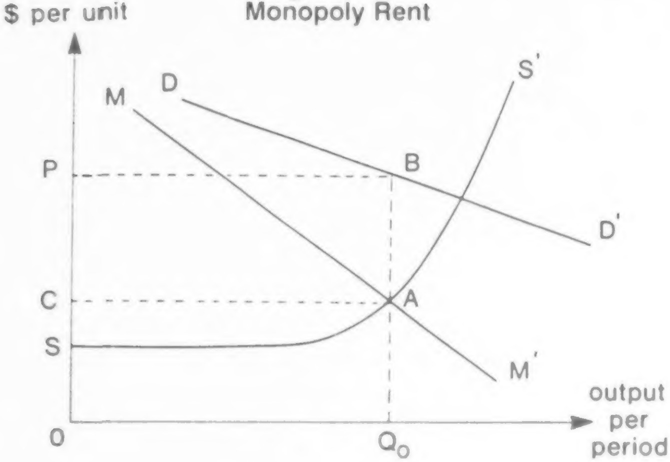
1. "Forward value" like "present value" is an operation that generates a value, at one point in time, equivalent to a dated series of cash flows over time. Whereas present value yields the value at the beginning of the series, forward value yields the value at the end. For present value, cash flows are discounted – at some predetermined discount rate – before being summed; the later the date of the cash flow the more heavily it is discounted. Conversely, for forward value cash flows are augmented – at some predetermined rate – before being summed; the earlier the date the more heavily augmented.

Figure 1-A
Differential Rent



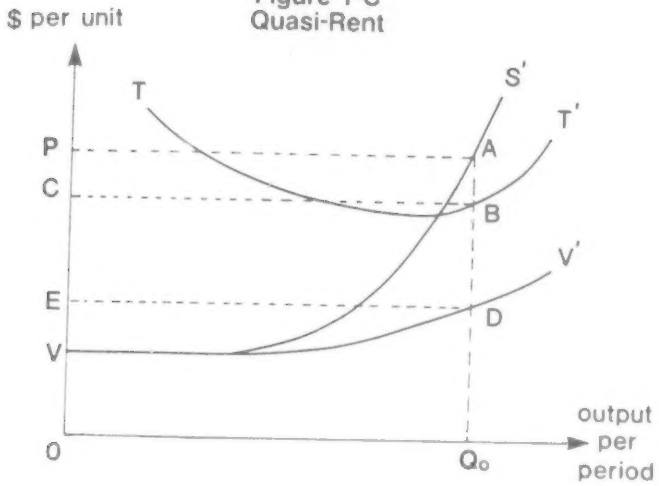
SS′ illustrates rising, long run, marginal (i.e. incremental) cost associated with each additional unit of output. Cost includes normal returns to both the capital and labour employed, but no payment to the scarce natural resource input. Due to diminishing productivity of additional units of resource, the value of labour and capital required per unit of output rises as the output level increases. A profit-maximizing producer will choose output level, Q_0. For the marginal unit of output, at Q_0, cost equals price, OP. On intramarginal units, a surplus of revenue over cost arises which amounts to differential rent. As illustrated, it is the area APS.

Figure 1-B
Monopoly Rent



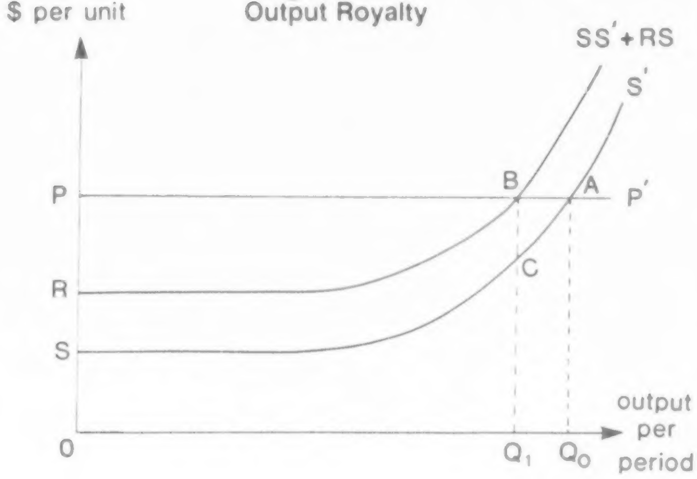
The producer faces a downward-sloping demand curve, DD′, and a marginal revenue curve, MM′. Profit maximization occurs at Q_0, where the additional revenue from an additional unit sold, Q_0A, equals the additional cost of its production taken from the marginal cost curve, SS′. Given the demand curve, DD′, the output $0Q_0$ will sell for a price OP, well above Q_0A. Total producer rent is ABPS. ACS is differential rent. The remainder, ABPC, is monopoly rent arising due to the producer's ability to restrict supply and therefore increase market price.

Figure 1-C
Quasi-Rent



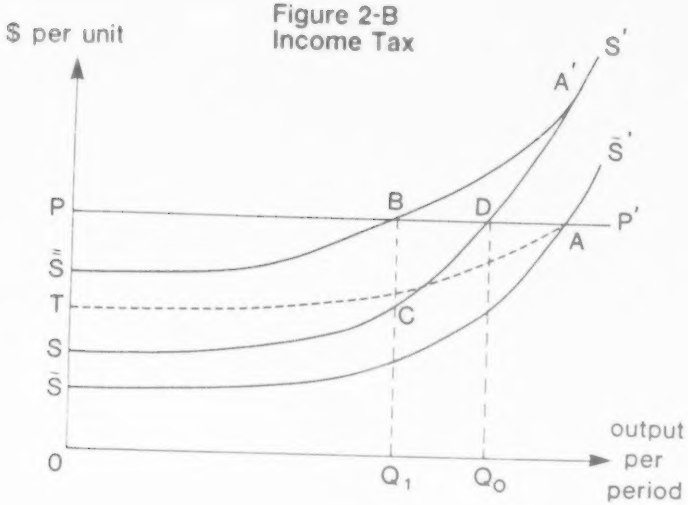
After a windfall increase in demand, price equals OP. The average variable (i.e. operating) cost per unit of output is given by VV'; short run marginal cost is VS'. Average total cost per unit of output (average variable plus acreage capital cost, is TT'. The producer is in short run, profit maximizing equilibrium at Q_0 where price equals marginal cost. The area BCED is quasi-rent required to cover capital costs. The area APCB comprises windfall profit.

Figure 2-A
Output Royalty



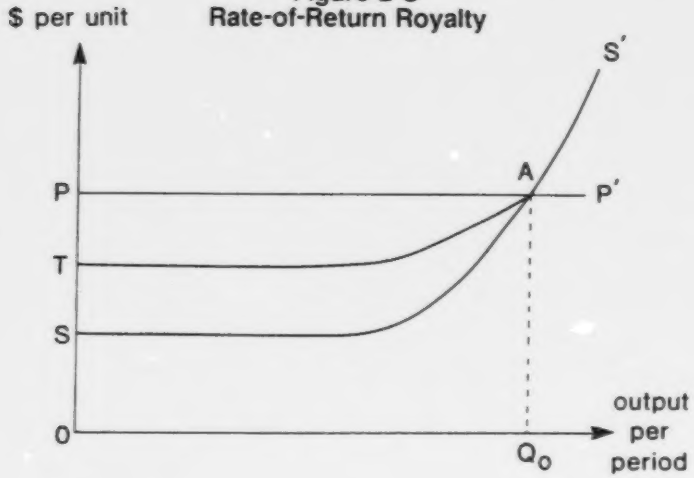
Sale price is OP. SS′ illustrates a rising long run marginal cost. Profit maximization occurs at Q_0. Total rent – all of which accrues to the producer – is the area APS. Imposition of a fixed royalty, equal to RS per unit of output, vertically displaces the producer's marginal cost for any level of output by RS. As illustrated, profit maximization now occurs at Q_1. The producer retains rent equal to BPR, and the government captures rent equal to RSCB. Note that imposition of the royalty is inefficient; it reduces aggregate rent by ABC. The royalty prevents realization of output Q_1Q_0, for which revenue exceeds cost.

Figure 2-B
Income Tax



Sale price is OP. The curve SS′ illustrates the long run marginal cost including normal returns to both capital and labour employed. ŠŠ′ illustrates the associated marginal operating cost per unit. Profit maximization occurs at Q_0. Consider imposition of an income tax levied at a fixed rate on production income (total revenue less short run operating costs). This tax can be illustrated by use of TA, points on which are a proportion equal to the tax rate, of the vertical distance between ŠŠ′ and PP′. The tax varies from TS per unit for initial production to zero at A. Long run marginal cost is now SS′ plus the tax. This new curve is ŠA′S′. Profit maximization now occurs at Q_1. Government receives rent of BCSŠ; the producer retains BPŠ. As in Figure 2-A, the income tax is inefficient because it reduces aggregate rent – by BCD.

Figure 2-C
Rate-of-Return Royalty



Sale price is OP. SS' illustrates short run marginal cost. Profit maximization occurs at Q_0. Consider imposition of a rate of return royalty levied at a fixed rate on production income. Unlike the income tax illustrated in Figure 2-B, the rate-of-return royalty is imposed only after the producer has recouped the capital cost incurred for the project. Like income tax, the royalty can be represented by use of TA, points on which are a proportion equal to the royalty rate, of the vertical distance between SS' and PP'. Since the royalty on production at the margin is zero, it does not affect the profit maximizing equilibrium, Q_0, and hence induces no loss of aggregate rent, APS. Aggregate rent is divided between the government, which captures ATS, and the producer, who retains APT.

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Chapter 2:

Natural Resource Rents and Hydroelectric Power: The Case of British Columbia and Manitoba

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Jean-Thomas Bernard
Raymond W. Payne

During the 1970s the issue of energy rents moved to the front of the Canadian political stage. Oil and natural gas prices skyrocketed in response to the market power of OPEC, unleashing a long and divisive political conflict in Canada. Provincial governments were quick to collect a share of the substantial windfall profits generated by rising prices, while the federal government tried to maintain Canadian oil prices below world levels and to appropriate its own share of the rents generated.

With oil prices rising, significant rents accrued to hydroelectric power resources which represent a close substitute for hydrocarbons in a wide range of applications. Electric utilities that generated their output from oil thermal facilities had to raise prices in order to maintain their financial position; this was not the case for electric utilities with access to hydroelectric power. Operating costs of hydro are almost nil. British Columbia and Manitoba found themselves in an enviable position since almost all their electricity is generated from hydro sources.

Neither the extent nor the distribution of the rents generated by these hydro resources has received the degree of attention given to hydrocarbon rents. This paper attempts to redress the balance; it estimates the level of hydro rents for British Columbia and Manitoba and accounts for the failure of provincial governments to appropriate any significant share on behalf of the general public.

Structure and Trends in the Industry

Table 1 summarizes some key statistics on hydroelectric generation in British Columbia and Manitoba. Line 1 indicates that almost all electricity generated in these two provinces is from hydraulic origin, a significantly higher proportion than the Canadian average. British Columbia and Manitoba together contributed one quarter of total hydroelectricity generated in Canada (line 2). Table 1 also illustrates that hydro is the main power source for both electrical utilities[1] and industrial establishments[2] in the two provinces. In Manitoba virtually all hydro power is generated by government-owned utilities, while in British Columbia industrial establishments produce more than one quarter of such power. Most private power comes from two primary metal producers, Alcan and Cominco.

Table 2 shows the pattern of electricity consumption by broad end-use category for Canada, British Columbia, and Manitoba. In British Columbia the dominant role of the industrial sector in general (55 per cent of consumption) and primary-based processing industries in particular (40 per cent) is evident. Both residential and commercial uses are more important components of consumption in Manitoba than in either British Columbia or Canada, and the role of electricity-intensive primary processing is much less pronounced.

Table 3 summarizes electricity production in British Columbia, Manitoba, and Canada over the last two decades. For Canada, total electricity generation was 3.2 times greater in 1980 than in 1960. British Columbia followed a similar growth path, while generation of electric power in Manitoba increased more than five times. Although the contribution of hydro power to total electricity generated in Canada fell from 92.5 per cent in 1960 to 68.0 per cent in 1980, British Columbia and Manitoba did not experience such a decline.

Table 4 shows the growth in net fixed assets of electric utilities from 1960 to 1980. In real terms, the value of these assets increased 2.6 times for Canada, 2.3 times for British Columbia, and 2.8 times for Manitoba. When adjusted for inflation, most of this asset growth occurred in the 1960s, with a marked slowdown in the 1970s. Clearly, publicly owned electric utilities dominate the utility scene in Canada; their share of net fixed assets increased from 72 per cent in 1960 to 94 per cent in 1980.

Table 1
Selected Statistics on Hydroelectric Generation In British Columbia and Manitoba, 1979
(per cent)

	Canada	B.C.	Manitoba
Total			
1- Hydro generation/total electricity generation	68.9	94.5	99.1
2- Share of total hydro generation, by province	100.0	16.8	8.4
3- Provincial consumption/total electricity generation	N.A.	95.6	69.2
Electric Utilities			
4- Hydro generation/total electricity generation by electrical utilities	67.9	98.2	99.5
5- Share of hydro generated by electrical utilities, by province	100.0	13.8	9.5
6- Utility generated hydro/provincial (Canadian) hydro generation	88.6	72.6	100.0
Industrial Establishments			
7- Hydro generation/total electricity generation by industrial establishment	77.4	85.9	N.A.
8- Share of hydro generated by industrial establishment, by province	100.0	40.4	0.0
9- Industrial generated hydro/provincial (Canadian) hydro generation	11.4	27.4	0.0

Source: Statistics Canada, annual, Tables 2 and 3.

Table 2
Consumption of Electricity by End-Use, (gigawatt hours)

	Canada	%	B.C.	%	Manitoba	%
Primary Processing	91,665	28.8	15,243	39.2	1,553	13.6
Secondary Manufacturing	32,085	10.1	2,723	7.0	959	8.4
Mining	21,791	6.8	3,295	8.5	1,110	9.7
Commercial/Institutional	72,659	22.9	7,933	20.4	2,918	25.6
Residential	87,245	27.4	9,292	23.9	3,518	30.9
Agricultural	7,840	2.5	92	.2	980	8.6
Other	4,596	1.4	333	.9	342	2.9
Total	317,881	100.0	38,911	100.0	11,380	100.0

Source: Statistics Canada, annual, Table 13.

Table 3
Generation of (tera watt hours)

Year	Canada		B.C.		Manitoba	
	Hydro	Total	Hydro	Total	Hydro	Total
1960	105.9	114.4	12.6	13.4	3.7	3.8
1965	117.1	144.3	15.4	18.8	5.3	5.5
1970	156.7	204.7	23.2	26.2	7.8	8.4
1975	202.4	273.4	31.0	34.5	14.3	14.8
1980	251.2	367.3	40.9	43.4	19.1	19.5

Source: Statistics Canada, annual, Table 2.

The British Columbia government established the predominance of public power relatively late. It nationalized the privately owned B.C. Electric Company in 1961, and the motive of W.A.C. Bennett's Social Credit government was more a desire to promote resource development in the province's hinterland than any ideological fondness for public ownership. Premier Bennett was determined to promote large-scale power developments on both the Peace and the Columbia Rivers, and the reluctance of the privately owned B.C. Electric Company to purchase Peace River power became a major obstacle (Sherman 1966; Swainson 1979; Payne 1981). Nationalization – combined with the export of Columbia power – allowed the construction of both projects in the face of market constraints. At the same time, it eliminated the cost of federal income tax formerly imposed on the net income of the private utility.[3]

Table 4
Total Net Fixed Assets of Electric Utilities

	Canada		B.C.		Manitoba	
Year	Millions of 1985$	Per cent Publicly Owned	Millions of 1985$	Per cent Publicly Owned	Millions of 1985$	Per cent Publicly Owned
1960	26,003	72	3,766	24	1,264	100
1965	33,038	92	4,421	98	1,948	100
1970	52,980	90	8,199	99	2,552	100
1975	51,956	91	7,566	99	3,601	100
1980	67,465	94	8,813	99	3,541	100

Source: Calculated from Statistics Canada, annual, Table 9.

In Manitoba public ownership was completed in 1953 with the purchase of Winnipeg Electric Railway Company (WERC) by the Manitoba Hydro-Electric Board. This takeover put an end to a long battle between supporters of public and private ownership. The battle had started in 1903 with creation of the City of Winnipeg Electric System to check the monopoly position of WERC (Vining 1981; Gordon 1981).

Apart from the important contribution of industrial establishments to the production of hydroelectric power in

British Columbia, the overall structure of the electric power industry is similar in the two provinces: Most of the electricity generated in each province is from hydraulic origin; electric utilities are largely publicly owned; and the industry has experienced rapid growth over the last two decades.

The Nature and Measurement of Hydroelectric Rent

The availability of hydraulic resources in British Columbia and Manitoba has enabled electricity producers to supply power at costs lower than those of producers in provinces without such resources. This point is obvious from Table 5 which reveals an inverse relationship between the average price of electricity within each province and the share of electric power of hydro origin. Hydroelectric sites are valuable assets to the provinces in which they are located.

Table 5
Average Price Per Kwh and Share of Hydro Generation
1979

	B.C.	Alta.	Sask.	Man.	Ont.	Que.[1]	N.B.	N.S.	P.E.I.	Nfld.[1]
(1) Hydro Generation/ Total Electricity Generation (Per cent)	94.5	6.5	26.5	99.1	38.7	99.6	34.0	19.0	0.0	83.1
(2) Average Price[2] per KWH (¢) (1985$)	3.85	5.16	4.32	4.38	4.16	3.19	5.95	7.42	11.50	3.48

[1] Churchill Falls output is attributed to Quebec.

[2] Includes distribution. 1979 price has been converted to 1985$ by GNE deflator.

Source: Statistics Canada, annual, Table 2 for (1) and Table 6 for (2).

If access to hydro sites was allocated through a competitive bidding process, the price that developers would be willing to pay would be determined by capitalization of the costs saved in not generating power by other modes. Hydro sites would be developed to the extent that they allow producers of electricity to reduce costs. This cost-saving would represent a differential rent if the site has no alternative use capable of generating a higher net benefit.

However, hydro sites have seldom been allocated through a competitive bidding process in Canada. Most sites have simply been given away by provincial governments to their respective public utilities or to private industrial producers. There are no observable bid prices that could be used to calculate directly hydro rents.[4] It is necessary, therefore, to assess them indirectly. One approach is to compare the difference in costs between supplying electrical demand by hydro and by other modes (Cairns 1983). An alternative approach to hydro rent estimation is based on the realizable net price of electricity exported to a wider market beyond the province. The two approaches generate equal rent estimates, of course, if the export price represents the costs of the other modes of power generation utilized in the first approach. Both approaches will be discussed.

Electricity Consumption and Production[5]

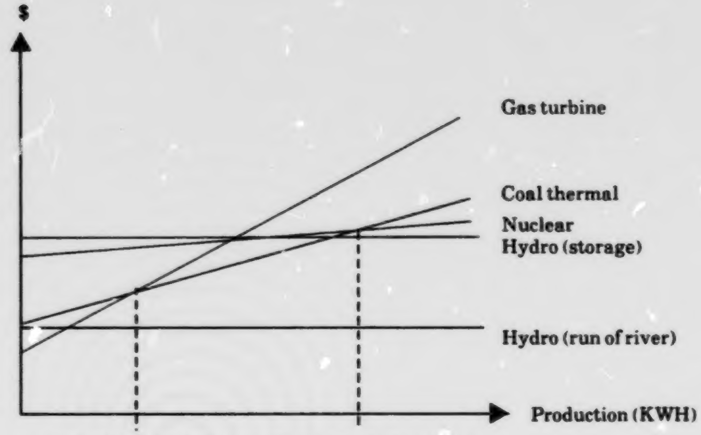
Generation of electricity has two important dimensions: *capacity*, the power required at each point of time, and *energy*, the power required over a period of time. (The first dimension corresponds to the rate, the second to the quantity.) Capacity is usually expressed in kilowatts (KW) and energy in kilowatt-hours (KWH). A tool commonly used to summarize these two dimensions is the load duration curve, as it appears in the lower part of Figure 1. Its horizontal axis indicates the length of time over a year that an electrical system has to provide at least the level of capacity indicated on its vertical axis. The area under the load duration curve represents total energy demand over a year.

Electric utilities must have at their disposal a combination of generating equipment sufficient to meet the demand for both capacity and energy as indicated by the load duration curve. Direct, large-scale storage of electricity to meet variations in this demand is not economically feasible.

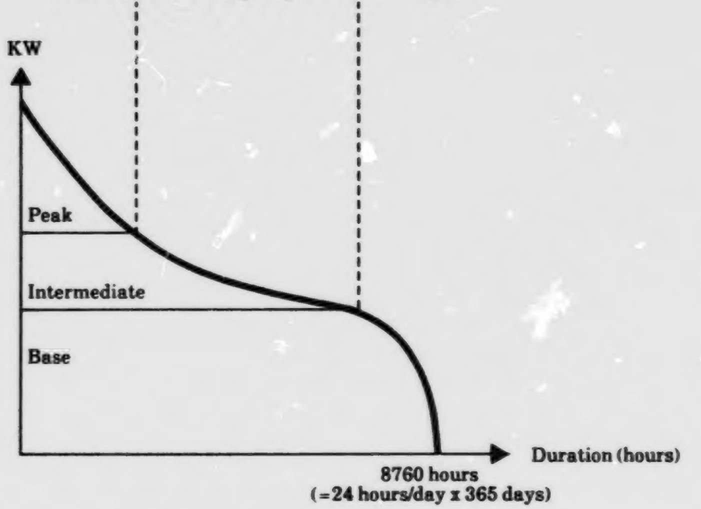
Electricity produced from hydraulic sources is limited not only by installed capacity, but also by the amount of water available for generation. In river systems with large seasonal fluctuations in water flow, relatively expensive storage facilities are needed to produce a dependable supply of energy. The initial capital investment for hydro plants is therefore large, but operating costs are almost nil.

While thermal power from coal, oil, or natural gas gives rise to a lower initial investment per KW of dependable capacity, operating costs are higher. The costs of nuclear power lie

Figure 1
Cost Relationship and Load Duration Curve



Total Cost of 1 KW capacity available for a year



Load Duration Curve for a Year

Source: Bernard, Bridges, and Scott, 1982.

somewhere between, with higher capital and lower operating costs than conventional thermal plants. Thermal plants pose additional problems: they must be taken out of service for maintenance on a regular basis; and they cannot meet peak loads as easily as hydro plants, implying the need for significant reserve generating capacity.

Given the operating characteristics and costs of each type of generating equipment, each electric utility must find that mix of equipment which satisfies the demand represented by the load duration curve at the lowest cost for an acceptable level of reliability. Of course the load duration curve is not completely independent of the rate structure. Higher rates reduce energy demand, and "time of day" pricing can shift the time of use, thus lowering peak demand.

The upper part of Figure 1 shows how thermal power and nuclear power compare in relation to their loads on the basis of relative costs. For power which is demanded over a short period only, the savings on initial investment associated with gas turbines are sufficient to compensate for their high operating costs. The converse is true for nuclear power, while oil and coal occupy an intermediate position. Clearly the shape of these curves is influenced by construction costs and by costs of the required fuels (coal, oil, gas, and uranium).

Figure 1 also illustrates the role played by hydro power. Run-of-the-river hydro plants are the cheapest to operate, and the initial investment also is relatively small. These characteristics make them a preferred source of power when river fluctuations are small (e.g. St. Lawrence/Great Lakes river system) or when the electric generating system to which they are attached is primarily thermal. However, when river systems are characterized by large flow fluctuations and hydro is the predominant source in an integrated electrical grid, as in Manitoba and British Columbia, large capital-intensive water storage facilities are essential. In predominantly thermal systems the erratic flow patterns of unregulated river systems can be used as fuel displacement energy (Krutilla 1967).

This description of electrical demand and supply has neglected several important variables such as the variability of precipitation, transmission losses, equipment failures, system interconnections and the relationship between tariff structures and load duration curves. Their omission is not meant as a denial of their importance.

Evaluating Hydroelectric Rent: Methodology and Data Sources

The following estimate of hydro rents is based on answers to two questions. What are the costs of producing electric power from hydro sources? And what are the costs of producing the required power from thermal and/or nuclear sources when the mix of equipment is selected to minimize costs? The difference between these two costs gives an estimate of hydro rent by the first of the approaches introduced above.

It is assumed that electrical utilities supply electricity to their respective grids at minimum cost. On the basis of this assumption, historical costs – corrected for inflation and properly discounted – represent the economic costs of developing hydro resources. For economic costs of the alternatives to hydro plants, the best available cost estimates of thermal and/or nuclear power have been used.

To make the concept of economic cost more precise, "average levelized cost" per unit of output is calculated for each project. This can be expressed as the sum of annualized capital recovery cost per unit of output, plus average operating cost per unit. These terms are derived, in turn, from a sinking fund calculation: determination of the constant annual amounts whose present values over the project lifetime equal the present values of estimated investment expenditures[6] and operating cost, respectively. These constant annual amounts, when divided by designed annual output, yield annualized unit capital and operating costs.

With respect to transmission, an effort has been made to identify only those additional costs which are specific to a hydro system and would not be required in a thermal system. In British Columbia lines of 500 kilovolts (KV) and greater are included, while in Manitoba only the direct current line from the northeastern region to Winnipeg is included.

For hydro projects, levels of production used to arrive at cost per unit of output are averages over a number of years depending upon the availability of data. For thermal and nuclear alternatives, levels of production for each type of unit are chosen to be within the ranges of efficiency presented in the *Interim Report* (Ontario Royal Commission on Electric Power Planning 1978, 26). These ranges of production efficiency are consistent with the description presented above. Since they reflect actual past experience, estimates of the economic life of projects are somewhat longer than those used by accountants for electric utilities.[7]

The evaluation of hydro rent depends upon assumptions concerning the alternatives to hydro power. Some qualifications must be kept in mind:

i) A crucial, simplifying assumption in the comparison of hydro and thermal power costs is that output – including externalities – is the same in every respect. This assumption neglects changes in the load duration curve which would result from the modified electricity tariff structure associated with thermal and nuclear power. It amounts to assuming that the demand for electricity in Canada is completely price inelastic. With respect to thermal power, each province's environmental standards have been considered in the choice of equipment. Coal plants are assumed to be equipped with flue gas desulphurization in British Columbia and Manitoba. Because of the intense controversy associated with nuclear power development in British Columbia, two options were considered for replacing hydro power: with and without nuclear technology.

ii) Thermal and nuclear power present different reliability characteristics compared to hydro power. Thermal performance is influenced by mechanical breakdowns while weather conditions play a larger role for nuclear performance. Taking into account the existing reserve margin in a province and characteristics of the added equipment, reserve capacity of 5.7 per cent in British Columbia and 3.4 per cent in Manitoba was added.

iii) The price index used to correct for the effects of inflation on hydro investment expenses is based on input prices with fixed weights. This implies that no technological changes took place in the construction of hydroelectric power sites. Since cost-reducing technological change probably did occur, it is likely that hydro costs are overestimated and hydro rents underestimated. Similarly, gains in thermal efficiency may occur in the future, yet are not considered. This may cause an overestimation of thermal and nuclear costs and, therefore, an overestimation of hydro rents.

iv) Prices of fuels have been linked to export values rather than to prices actually paid by electric utilities. For example, B.C. Hydro argues that the Hat Creek coal deposit has no alternative current use and that its value equals its extraction cost, estimated at $9.09 a ton in 1979. However, from a provincial perspective, a royalty could be charged equal to the difference between the extraction cost of Hat Creek coal and the net price from sale to the highest bidder (assumed to be the customers for exported East Kootenay coal). The gross value of Hat Creek coal has been set to the estimated BTU equivalent export price of $19.00 a ton. Coal that would be used in Manitoba is assumed to come from Saskatchewan. Similarly, uranium dioxide has been valued at an export price of $220/kg (1985$), which has been determined by a uranium cartel since 1973 (Ontario Royal Commission on Electric Power Planning 1978, 112). Export-based values are superior to accounting costs borne by utilities since they reflect the value of the fuels in their best alternative uses.

Empirical Results

Table 6 presents estimates of the average economic costs of generation and transmission from hydro sources while Table 7 shows estimates of hypothetical economic costs of the thermal/nuclear replacement. The average cost of hydro power is 19.7 mills in British Columbia versus 27.3 mills in Manitoba. Both generation and transmission costs are lower in British Columbia.[8] Also, the average cost of thermal/nuclear replacement is less in Manitoba than in British Columbia, where construction costs are the highest in Canada. Finally, the effect of a nuclear moratorium in British Columbia is quite severe, increasing the average cost of the alternative thermal/nuclear mix from 38.4 mills to 59.0 mills.

The first row of Table 8 shows the average cost differential per KWH between hydroelectricity and thermal/nuclear replacement. This is the estimate of rent per KWH that can be attributed to the presence of hydraulic resources. British Columbia has a higher figure because of its lower hydro power cost and its higher hypothetical cost of thermal/nuclear replacement.

In order to obtain an estimate of total hydroelectric rent in each province, average rent per KWH is multiplied by *total* hydroelectricity production. This assumes that average costs of hydro production are the same for industrial establishments – for which no financial information is available – and for public electric utilities which served as the basis for the estimates. This assumption probably understates hydroelectric rents in British Columbia where the production of hydroelectric power by industrial establishments is of some significance. Industrial establishments in British Columbia occupy favourable hydro sites; they have a higher load factor than public electric utilities; and their capital costs are spread over a larger output. The third row of Table 8 shows provincial estimates of hydroelectric rent.

The use of nuclear power in British Columbia lowers the rent in that province by about $845 million a year. The fourth row displays hydroelectric rent per capita on the basis of June 1981 population.

Table 6
Average Cost of Hydro Power
(Mills per KWH, 1985$)
(10 mills = 1 cent)

		British Columbia	Manitoba
I.	Generation:		
	Capital	15.3	20.2
	Operation	1.5	1.5
II.	Transmission:		
	Capital	2.3	5.0
	Operation	0.6	0.6
III.	TOTAL	19.7	27.3

Source: Bernard, Bridges, and Scott, 1982, 35. (Dollar figures have been updated to 1985$ by the GNE price index).

Calculations for British Columbia exclude the three dams covered by the Columbia River Treaty because their power output is realized in the United States and no cost information could be obtained for this additional output. Another way of handling this particular project would be to consider the cash payments received from the United States as a measure of the benefits and then subtract the costs incurred in Canada. Preliminary calculations of this difference indicate that the result is negative. The calculations also exclude potential power from undeveloped hydro sites; consequently, they underestimate potential hydro rents.

As mentioned above, the application of the alternative cost principle assumes no changes in the load duration curve. The tariff structure that would emerge under the higher cost alternatives would reduce demand for electricity unless it is completely inelastic. An approximation of total rent which takes into account the effects of higher prices is presented in the last

Table 7
Approximate Average Cost of Alternative Thermal/ Nuclear Energy

	B.C. without nuclear power	B.C. with nuclear power	Manitoba
Capacity (MW)[1]	7,594	7,594	3,635
Energy (GWH)[2]	40,928	40,928	20,443
1. NUCLEAR			
Capacity (MW)		6,700	2,000
Energy (GWH)		40,077	13,140
Capital cost (mills)[3]		29.5	20.9
Operating cost (mills)		6.9	6.4
Total cost		36.4	27.3
2. COAL THERMAL			
Capacity (MW)	6,300		1,500
Energy (GWH)	40,077		7,096
Capital cost (mills)	32.1		29.2
Operating cost (mills)	25.0		18.6
Total cost	57.1		47.9
3. GAS TURBINE			
Capacity (MW)	1,725	1,325	260
Replaced (MW)	1,294	894	135
Reserve (MW)	431	431	125
Energy (GWH)	851	851	207
Capital cost (mills)	82.2	63.1	50.9
Operating cost (mills)	68.6	68.6	68.5
Total cost (mills)	150.7	131.7	119.5
4. AVERAGE TOTAL COST, THERMAL/NUCLEAR: (mills)	59.0	38.4	35.4

[1] MW = 10^3 KW

[2] GWH = 10^6 KWH

[3] mills per KWH, 10 mills = 1 cent, 1985$

Source: Bernard, Bridges and Scott, 1982, 43. (Dollar figures have been updated to 1985$ by the GNE price index.)

row of Table 8. The estimate of demand elasticity used for this purpose is 0.60 (Osler 1977, 76). The estimate of total hydroelectric rent would decrease substantially in British Columbia while the decrease would be rather small in Manitoba. The corresponding decrease in output is 30 per cent in British Columbia without nuclear technology and 19 per cent with it, while it is 7.4 per cent in Manitoba. This decline, however, could be offset by exporting surplus electricity.

Table 8
Estimates of Potential Annual Hydroelectric Rents
(1985$)

	B.C. without nuclear power	B.C. with nuclear power	Manitoba
Rent per KWH (mills)	39.3	18.7	8.1
Hydro Production in 1979 (KWH x 10^6)	40,928	40,928	20,443
Total Rent (millions of $)	1,609	765	165
Rent per capita	594	282	159
Total rent adjusted for demand elasticity (millions of $)	1,121	653	152

Note: Rent is calculated on the entire hydro production of both provinces. However, this total includes some power sold on an interruptible basis. It cannot command the same price as firm power. Interruptible output tends to fluctuate from year to year depending on water conditions, and its inclusion in these calculations does tend to overstate total rent somewhat.

Source: Bernard, Bridges and Scott 1982, 44. (Dollar figures have been updated to 1985$ by the GNE price index).

Alternative estimates of hydro rent are contained in a recent study by Zuker and Jenkins (1984) for the Economic Council of Canada. The results, summarized in Table 9, differ significantly from the estimates in this study. One explanation for the discrepancy in the case of British Columbia is that Zuker and Jenkins use only purchased electricity consumption to generate their total rent estimate, whereas this study also includes hydro power generated by industrial users. The differences in per unit rent estimates between the two studies are almost entirely explained by differences in the cost estimates for an alternative thermal system. For example, this study estimates an average unit cost of 35.4 mills (1985$) for a predominantly nuclear system in Manitoba (see Table 7); Zuker and Jenkins estimate a unit cost of 67.9 mills for a coal based system (1985$). The corresponding non-nuclear estimates for British Columbia are 59.0 versus 64.8 mills, with this study estimating an even lower cost of 38.4 mills for a nuclear/thermal alternative.

Table 9
Comparison of Hydro Rent Estimates for 1979

	This study		Zuker and Jenkins	
	millions of 1985$	mills/kwh	millions of 1985$	mills/kwh
Manitoba	165	8.1	838	44.6
B.C. without Nuclear Power	1,609	39.3	1,243	50.5
B.C. with Nuclear Power	765	18.7	N/A	N/A

Source: Zuker and Jenkins, 1984, Table 4.2 (dollar figures in Zuker and Jenkins have been updated to 1985$ by the GNE price index; this study, Table 8.

Another difference between the two studies is the discount rate used to measure the social opportunity cost of capital – the forgone benefit of not using the capital elsewhere. This study employs a rate of 7.44 per cent; Zuker and Jenkins (1984, 17) used 10 per cent. The higher the rate assumed, the greater the forward value cost estimate for capital-intensive hydro systems and the lower the rent estimate.

The second approach to rent estimation is to employ the concept of opportunity cost in a wider market area. If it is possible to import or export power freely between a producing province and other jurisdictions, then opportunity cost is equivalent to the price at which such transactions can take place. Opportunity cost will be a function of the costs of power production in other jurisdictions and transport costs. Rent is measured not against the costs of providing a similar quantity of power to the domestic market using the next-best technology; rather, it is evaluated against either the extra costs of importing domestic requirements or the benefits forgone by not selling domestically consumed power in available export markets.

Traditionally, private firm exports and imports of power across provincial and international boundaries have been relatively uncommon, thereby limiting the practical applications of the above approach. However a recent long-term, export contract negotiated between the Manitoba Energy Authority and a U.S. utility, Northern States Power (NSP), does allow the use of this opportunity cost approach for Manitoba.

The price of power sold by Manitoba to NSP has been set at 80 per cent of the costs of NSP's newest thermal generation facility. While the costs of this facility (currently under construction) are subject to some uncertainty, Manitoba projects the present value of revenue from the power sale at $727 million (1985$). As shown in Table 10, rent estimated according to the opportunity cost of not exporting total 1979 hydro output on these terms is $103 million.

This rent estimate is lower than the $165 million calculated on the basis of an alternative, non-hydro Manitoba system because Manitoba is collecting only about half of the difference between the cost of hydro power and the cost of thermal power under the 80 per cent pricing formula. In a situation where the buyer and seller have equal market power, such a split of cost savings is inevitable. Were the opportunity cost assumed to be the NSP's unit thermal generating costs, the opportunity cost rent estimate would approximately double. Such a figure is reasonably close to this study's estimate based on the cost of a Manitoba nuclear/thermal system. This throws considerable doubt on the higher rent estimate of Zuker and Jenkins. If Manitoba's thermal costs (1985$) were 68 mills as they estimated, rather than the 35 mills as estimated here and the province had no hydro resources, it would import its requirements from the United States rather than produce power itself.

Table 10
Manitoba Hydro Rents Estimated on an Opportunity Cost Basis

Present Value of Revenue from power sale to NSP (1985$)	$727 million
Price/KWH of power sale to NSP (1985$)	32.3 mills
System Cost/KWH (1985$)	27.3 mills
Rent/KWH (1985$)	5.0 mills
Rent on 1979 Manitoba Output (1985$)	$103 million

Source: Based on data in: National Energy Board, 1985.

The Political Economy of Hydro Rents and their Distribution

While the previous section has estimated sizeable hydroelectric rents for Manitoba and British Columbia, neither province has made rent collection a central goal of economic policy. With very few exceptions,[9] access to falls and river basins for hydroelectric development was granted virtually free to public and private developers throughout Canada. There were no bidding processes that could have revealed the expected rents and no payments for these benefits to the provinces as resource owners.

The only tax raised specifically from hydro resources has been the water rental. Table 11 shows the amounts collected in British Columbia, Manitoba, and Canada. With the exception of British Columbia since 1982, the amounts collected have been insignificant in relation to the rent estimates presented above. Water power rentals have been little more than nominal licence fees for access to hydro sites, similar to those traditionally levied on mineral claims and leases.

In British Columbia, water rentals have recently become a more significant revenue source, totalling some $165 million in fiscal 1982/83. These increased rentals do not necessarily mean, however, that British Columbia is now collecting hydro rents. According to Zuker and Jenkins (1984, Table 4.1), electricity rates in British Columbia collected only 51 per cent of the true average costs of the existing hydro system, producing a revenue shortfall of some $690 million. Far from capturing a share of resource rent for the crown, British Columbia's higher water rental charges merely lowered the subsidy to the provincially owned power utility. Public utility ownership also means that federal and provincial income taxes are not levied on the income generated by electric power production, which further decreases the share of hydro rents collected by governments.

Table 11
Water Power Rentals
(current $1000)

YEAR	CANADA	B.C.	MANITOBA
1977-1978	40,450	14,589	2,624
1978-1979	62,658	15,239	3,904
1979-1980	60,118	14,994	5,007
1980-1981	67,950	20,157	7,824
1981-1982	125,342	70,000	10,199
1982-1983	224,997	165,000	10,340

Source: Canada, Department of Finance, unpublished.

Rates charged by both utilities in the two provinces traditionally have been set at levels just adequate to cover operating costs, depreciation, property taxes, and interest charges on completed projects, with interest on plant under construction being deferred to future years. In the first 20 years of B.C. Hydro's existence, the utility's rate of return on capital employed has been significantly lower than the interest rate on its outstanding debt. Manitoba Hydro has had a persistent operating loss since the mid-1970s (B.C. Hydro, 1983; Manitoba Hydro-Electric Board, 1984).

In both Manitoba and British Columbia much of the rent generated by hydro resources has been passed on to consumers in the form of electricity prices below those of alternative thermal sources. This involves both a transfer payment from the owners of the resource to consumers and an efficiency loss arising from that portion of power sales for which cost exceeds consumers' willingness to pay. In British Columbia, the real cost of developing new hydro sources has more than doubled over the last decade so that prevailing prices have not reflected even the true long run marginal costs of hydroelectric power.[10] In Manitoba, where the problem of rising marginal costs has not been as pronounced, prices to domestic consumers are well below those which could be obtained by exports to the United States.

In British Columbia, residential and large industrial users have enjoyed most of the benefit from low electricity costs. In terms of B.C. Hydro's own average cost accounting, residential customers paid around $688 million (1985$) less than their share of costs in 1967-1982; bulk customers $132 million less; while commercial and small industrial users paid $847 million more.[11] However, as Osler (1977) has pointed out, this average cost calculation significantly understates the benefits traditionally enjoyed by the approximately 60 bulk customers who account for a third of B.C. Hydro's electricity demand. In British Columbia's hydro-based generating system, it is the energy, rather than the capacity, constraint which has necessitated most new investment (Osler 1977, 89).

Hydro rents also have been dissipated during the 1970s by the construction of surplus capacity. In British Columbia the crown-owned utility did not take into account either changing industrial structure or rising energy prices in its demand forecasts, and as a result did not adjust its construction plans to declining electrical load growth. Between the early 1970s and early 1980s, the utility's surplus generating capacity increased from about 20 to 60 per cent of total capacity, even before the 2700 MW Revelstoke dam had come on stream (B.C. Hydro, various years). This project, commissioned in 1977 amid intense public controversy, proved entirely surplus to provincial demand when it commenced production in early 1984. Although B.C. Hydro has been successful in selling some of this surplus to the United States, the revenue generated is well below cost (B.C. Hydro 1983; B.C. Ministry of Energy, November 8, 1983). While the imbalance between supply and demand has not been as great in Manitoba, surplus capacity has been around 30 per cent during the 1970s and early 1980s (Manitoba Hydro 1984).

Why have hydro rents been passed on to consumers in the form of low prices or dissipated in system overexpansion? Historical evidence suggests two complementary explanations, one based on public perception of hydroelectricity and economic development, the other on the nature of decision making in public corporations.

Unlike petroleum and natural gas resources, electricity has not been perceived by policy makers as a staple product in its own right. As a result, its active development for export was not promoted; rather, inexpensive hydro power was perceived as a critical component of the provincial economic infrastructure. Cheap electricity was important both in developing the key forward linkages from mineral and forest resources and in diversifying the Canadian economy (Innis 1933; Dale 1957; Nelles 1974).

Early public resistance to electricity exports was intensified by Canada's unsuccessful attempt to obtain the return of power exported to the United States during the First World War (Grauer 1961). Not until W.A.C. Bennett's policy in the 1960s of exporting the downstream benefits from the Columbia River did a major reversal occur of the federal prohibition of long-term power exports (Swainson 1979).

Even after this far-reaching precedent, there was relatively little interest in the development of power projects for export. In British Columbia, a policy of exporting only temporary surpluses from high-water years emerged during the 1960s and persisted through the early 1980s.

Since the benefits of hydroelectric development were assumed to be related to its contribution to domestic economic development, it is not surprising that the distribution of rents to consumers through low prices was perceived as generating a social benefit rather than a cost. Low prices enhanced the standard of living of the residential consumer and encouraged the development of forest and mineral-based staple exports. In sharp contrast was Alberta, where the goal of maximizing economic benefits from oil and gas resources prompted more active collection of rents. In Alberta, since the resource was developed largely by externally based multi-national corporations for sale in export markets, the only alternative to such a policy was to forgo much of the benefit from resource extraction.

This historical pattern appears to be changing in a fundamental way. In British Columbia, problems arising from the increasing costs of new hydro projects and associated environmental concerns have led many to question the benefits of previous hydro pricing policies. Rates in the mid-1980s are much closer to marginal costs than they were in the 1970s. In addition, surplus capacity has forced the provincial government into active promotion of longer-term power exports. Unfortunately, the need to sell large quantities of power from existing plants in an unfavourable regional export market has led to prices well below those necessary to cover the full costs of Revelstoke, the most recent hydro project. This experience may lead British Columbia policy makers to gear future developments to the demands of both export and domestic markets.

In Manitoba the promotion of large, long-term power exports has recently become a key element of the provincial government's economic strategy. The government has actively sought out such export activities and, as discussed earlier, in 1984 a major long-term contract was signed with a U.S. utility, Northern States Power. The contract calls for the export of 500 MW of power per year, for 20 years, at a price equal to 80 per cent of the costs of the U.S. utility's alternative thermal option (National Energy Board 1985). The Manitoba government is currently considering more such exports and the acceleration of Manitoba Hydro's expansion plans to serve them. In another significant break from previous provincial policies, the Manitoba government also has announced its intention of retaining a share of the rents generated by these new power exports, rather than allowing them to be retained by Manitoba Hydro.

In recent years a great deal has been written concerning the dynamics of decision making within the publicly-owned corporation (Trebelcock et al. 1982; Borcherding 1983; Baldwin 1975). Although the public enterprise sells its products in a marketplace, a number of impediments to efficient production have been suggested. Since ownership of the public firm is both dispersed and non-transferable, there is no effective way the "owners" (general public) can exercise the supervision necessary to achieve an economically efficient use of productive inputs. The managers of the enterprise, having no claim on the capitalized value of an efficiently run enterprise, may pursue "pay, power, and prestige" goals, achieved primarily through organizational expansion. Vining, in his survey of provincial crown hydro utilities, has suggested that such organizations will "minimize profits (subject to loss constraints) both to maximize political support and to encourage further demand growth. . . cross subsidize to large users. . . and. . . utilize a too low discount rate and consequently expand capacity too quickly" (Vining 1981, 180).

While this line of argument draws too sharp a distinction between the large bureaucratic corporation in the public and private sectors and underestimates external political control of crown corporations,[12] its conclusions do coincide with much of the observed behaviour of Canadian publicly owned electric power utilities. In British Columbia, for example, Hydro's pricing and expansion strategies arose out of the resource development policies of the W.A.C. Bennett government, but were perpetuated after the electoral defeat of that government in 1972. System expansion was aggressively pursued by B.C. Hydro throughout the 1970s, despite strong evidence of declining load growth and serious misgivings among members of successive provincial administrations.

Similarly, poor planning of major hydro developments in Manitoba in the early 1970s led to the establishment of a royal commission which was scathing in its criticism of Manitoba Hydro, pointing to significant and persistent defects and deficiencies in the practices and procedures under which it carried out its overall planning, the implementation of its chosen developments and its energy management responsibilities (Manitoba 1979).

These experiences have led to a pronounced shift within government of policy and planning authority away from the crown hydro corporation. In British Columbia new analytical capability was added to the Ministry of Energy, Mines and Petroleum Resources in 1980, and a new Utilities Commission was established with wide-ranging regulatory authority over both power rates and new generation projects (Payne 1982). In Manitoba the new export-oriented power policy is being directed by the Manitoba Energy Authority, a separate crown corporation, not by Manitoba Hydro.

Policy Options

The preceding analysis suggests that significant rents from hydro resources will not be collected by provincial governments without widespread public perception of the benefits in doing so. Disregarding the separate issue of rent dissipation through the inability to forecast demand growth accurately, the benefits of collecting rents relate primarily to the more efficient allocation of resources in the economy as a whole. Consumers demand more electric energy than they would if prices reflected true marginal costs, and society's productive resources are inefficiently diverted into power production. Since this argument is difficult to present in a politically appealing fashion, provincial governments have been reluctant to risk alienating residential and key industrial power users through the imposition of higher rates. For example, British Columbia's move to capture hydro rents through steep increases in water licence fees has generated vocal and sustained criticism from large industrial power users.

A number of policy directions would enhance the political viability of collecting hydro rents. The first is a more explicit consideration of developing hydro resources as a staple export. As already noted, this has already become government policy in Manitoba. It is more controversial in British Columbia due to the prominence of environmental issues. Regardless of whether the benefits from long-term exports are ultimately judged to exceed the social and environmental costs of specific projects, explicit consideration of the export market focuses attention on the relevant opportunity costs. Long-term contracts also could lessen the risks associated with the construction of large hydro projects and avoid the need to seek export markets under unfavourable conditions.

In addition, pricing schemes designed to reflect the opportunity costs of hydro resources should include mechanisms to make them more acceptable to consumers. There is widespread public scepticism concerning the benefits of transferring large sums of money to crown corporations or government bureaucracies through higher electricity rates. When prices are designed to reflect true opportunity costs, a system of rebates to consumers, independent of consumption levels, could ensure that hydro rents are distributed equitably to the general public as resource owners.

Crown hydro utilities could be restructured to alleviate the tendency to dissipate rents through over-expansion. For example, a 1979 report by British Columbia's Legislative Committee on Crown Corporations suggested breaking up B.C. Hydro into several distinct entities (responsible for construction, sales, and administration) under a holding organization responsible for overall financial planning (British Columbia Legislative Committee 1979). Such an arrangement would ensure greater openness and accountability by fixing organizational responsibilities more precisely within an overall energy strategy determined at the cabinet level.

Finally, the probability of rent collection at the provincial level could be enhanced by the development of a federal equalization formula which takes explicit account of the rents generated by hydro resources, regardless whether or not these rents are reflected in provincial revenue. Such a formula would be more equitable. It would not discriminate, as it does at present, against provinces which benefit from their resources in the form of government revenues rather than low prices to consumers.

Notes

1. Electric utilities are all enterprises engaged in the production, transmission, and distribution of electric power for use by the public.

2. Industrial establishments are enterprises producing electricity mostly for their own internal use. They may also distribute power to nearby communities and exchange power with electric utilities.

3. Elimination of federal income tax also was used as a justification by the Province of Quebec when it completed the takeover of its electric utilities in 1962.

4. Users of electric power sites pay water power rentals to the provinces. However, the amounts collected from that source are relatively minor as will be seen in Table 11. They could be considered licence fees; they are not a reasonable estimate of hydro rent.

5. Turvey and Anderson (1977) provides a comprehensive description of electricity modelling.

6. Annual investment expenses for hydro projects have been obtained either from annual reports of B.C. Hydro and Manitoba Hydro or from data provided to the authors by these two public utilities.

   To calculate the present value of real investment expenditures, recorded or estimated investment expenditures for a particular project have to be corrected for inflation and interest during construction. This involves three steps:
   (i) Correction for inflation to express expenditures in constant dollars (1985$)
   (ii) Removal of interest accumulated during construction to arrive at expenditures on factors of production
   (iii) Calculation of the forward value of constant dollar expenditures at the real rate of discount up to the point when the equipment becomes operational. The "real rate of discount" is the net rate after deducting inflation. The real discount rate used for the present purpose is 7.44 per cent. This is an average of the real after tax rate of return in the Canadian business

sector from 1956-1972, and it is supposed to capture the opportunity cost of funds in the Canadian economy. See H. Helliwell *et al.* 1973.

For large projects, not all generating units come on stream at the same time. In such cases, accumulated real investment expenditures are prorated on the basis of capacity as it becomes operational.

7. The economic lives are assumed to be: hydro plants (75 years), transmission lines (35 years), coal plants (35 years), heavy water plants (25 years), nuclear plants (30 years), and gas turbines (35 years).

8. The results for transmission capital costs were unexpected since geography is more favourable in Manitoba than in British Columbia. However, the direct current lines built by Atomic Energy of Canada Limited for Manitoba Hydro are the only ones of this type in Canada.

9. At the turn of the century, a few falls in Quebec were sold through auction. See Dales (1957).

10. Generation projects completed in the late 1970s and early 1980s had a 1985$ cost ranging from 10.6 to 12.7 mills per KWH for at-site energy. Similar costs for the Revelstoke project completed in 1984 were around 21.2 mills, while those for the recently deferred Site C project are over 31.8 mills. See B.C. Utilities Commission (1983) and B.C. Ministry of Energy, Mines and Petroleum Resources (April 1983, 179).

11. Based on information supplied by B.C. Hydro officials.

12. Galbraith (1967), for example, has asserted that similar tendencies develop in large private corporations where management becomes separated from ownership. Gunton's case study of Inco in this volume provides a good illustration of this point.

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Chapter 3:

Manitoba's Nickel Industry: The Paradox of a Low Cost Producer

Thomas Gunton

In 1961 the International Nickel Company (Inco) completed construction of an integrated nickel operation at Thompson, Manitoba. With the opening of this facility, Manitoba became a significant world producer of nickel. Buoyed by optimistic demand forecasts, plentiful reserves and healthy profits, Inco expanded Manitoba output throughout the 1960s and early 1970s. However, by 1977 Manitoba's nickel industry entered a period of rapid decline, with output falling from a 1970 peak level of 156 million pounds to 57 million pounds in 1982. During the same period, Inco fell from high profitability to the verge of insolvency.

This chapter analyzes this prodigious decline in the fortunes of Inco and Manitoba's nickel industry. It begins with an overview of the world nickel industry, followed by a discussion of the evolution of the industry in Manitoba. Finally, policy implications of the Manitoba nickel industry experience are assessed.

Introductory Considerations

Nickel is an alloy agent in a wide range of uses requiring heat-resistant, high-strength components. Its most common use is in production of stainless steel for goods such as aircraft, automobile components, and appliances.

Nickel production requires several stages. The first is production of a concentrate which is rarely marketed because it is a highly unstable substance, subject to spontaneous combustion. The second stage is smelting the concentrate to produce a nickel matte. The final stage is refining the matte to produce either Class I products, which are almost pure nickel with universal applications, or Class II products, which have less than 95 per cent nickel content and more restricted applications. Most nickel firms are vertically integrated, controlling production from extraction of the ore to smelting and refining.

The mineral is found in two types of ore bodies: sulphide ores, found predominantly in Canada and which account for 20 per cent of world reserves and 55 per cent of world output, and laterite ores located in Third World countries. Although the sulphide ores are more costly to mine because the ore is located further below the surface, they are cheaper to process because they require about one fifth the energy input required to process laterite ores. Sulphide ores are also more suitable for upgrading into Class I nickel products. Canadian sulphide ores, then, command a substantial differential rent by virtue of their lower processing costs and high grades (Canada 1984; Cairns 1980; World Bank 1979). This is displayed in Figure 1.

Nickel production is highly concentrated, both in geography and corporate sales, with Canada and Inco (which is largely Canadian based) the dominant producers. Until recently, the performance of the industry could be understood best by the dominant firm model illustrated by Figure 2 (Copithorne 1979, 44-50; Hwang and Smithson 1986). As the dominant firm, Inco maximizes profit by restricting output to maintain high prices. Other small producers operate as competitive price takers, producing to the point where marginal cost equals price. Inco's problem is estimating market demand and the supply curves of its competitors. If it allows prices to rise too high, or underestimates potential output of its competitors, it will rapidly lose its market power. This is precisely what happened in the 1970s.

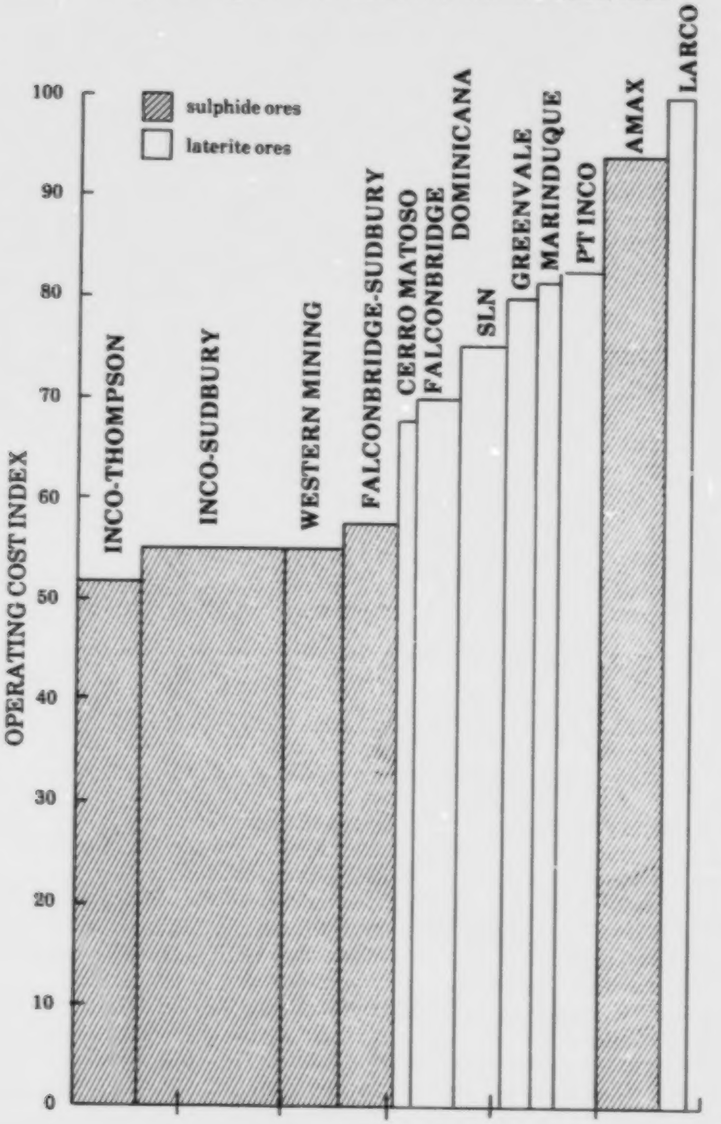
Evolution of Manitoba's Nickel Industry

As Figure 3 illustrates, the evolution of Manitoba's nickel industry can be divided into three periods: rapid growth, 1960-1970; relatively stable output, 1971-1976; and decline after 1977.

Rapid Growth, 1960 to 1970

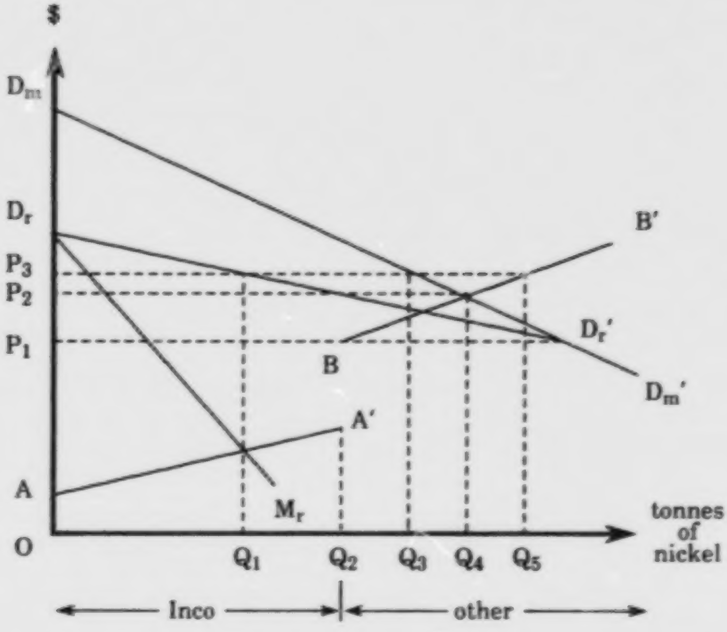
The impetus for rapid growth came in 1956 when Inco discovered one of the world's richest nickel deposits, in northern Manitoba. Eager for economic development, the Manitoba government offered Inco exclusive rights to most of the province's nickel

Figure 1
Operating Costs for Selected Nickel Mines, 1983



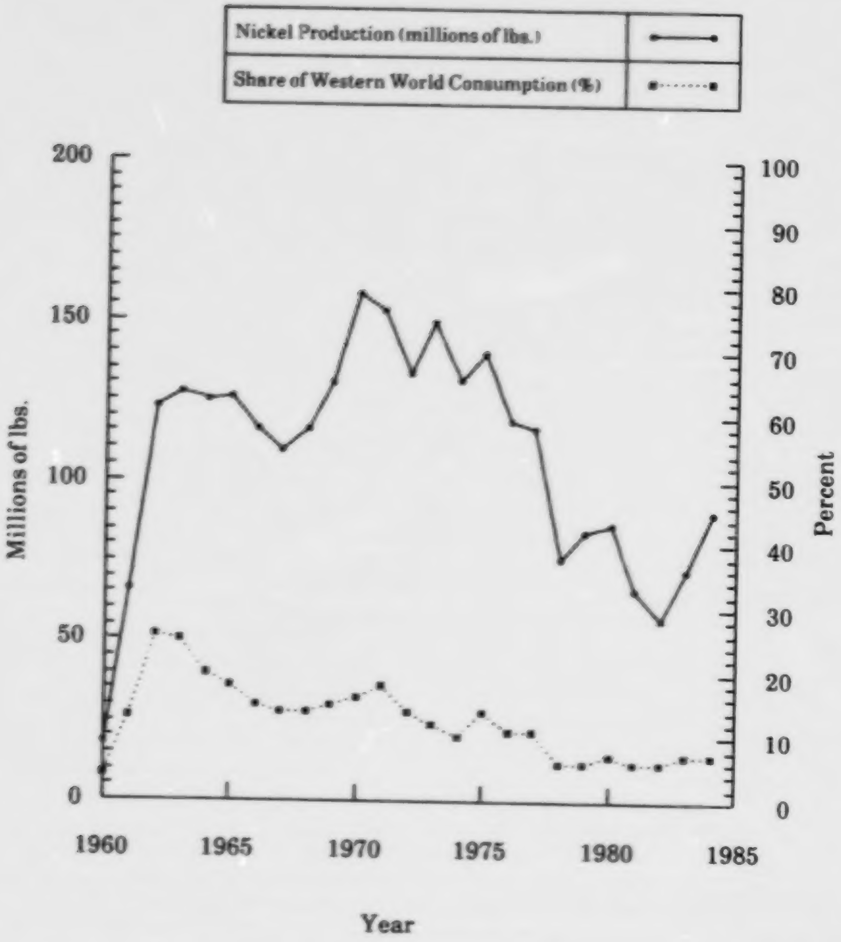
Source: Canada 1984, 25.

Figure 2
Price Leadership by Dominant Corporation



Assume Inco possesses higher grade, lower cost nickel deposits with supply curve AA'. Other producers have lower grade deposits with supply curve BB'. Inco estimates the residual demand curve, D_rD_r' for its own output as the difference – over the price range – between market demand D_mD_m' and the output of other producers. As price rises above OP_1, other firms enter the market. Under competitive conditions price is OP_2; total output is OQ_4; Inco's share of output is OQ_2 and that of other firms Q_2Q_4. Inco's profit maximizing position is defined by the intersection of its supply curve AA' and its marginal revenue curve D_rM_r. Inco reduces output from OQ_2 to OQ_1, thereby raising price from OP_2 to OP_3. At this price other producers benefit by increasing their output to Q_1Q_3 (which is equal to Q_2Q_5).

Figure 3
Manitoba Nickel Production and Market Share
1960-1984



Source: Computed from data from Manitoba, Department of Energy & Mines. annual. Roskills, 1984 deposits, through special 63-year leases which overrode the normal provisions of the *Mining Act*. With security of supply assured, Inco built an integrated smelter/refinery complex at the new town of Thompson. The complex was designed to produce a high-quality refined nickel used as an alloy in metal-fabricating industries located predominantly in the United States (Hedlin Menzies 1970). Faced with strong demand, Inco expanded its capacity and output throughout the 1960s. In 1970 Inco's Manitoba output reached a peak of 141 million pounds, just over one quarter of Inco's total production. Inco's Ontario division accounted for the remainder (see Appendix 1).

Transition, 1971-1976

After rapid initial growth, Manitoba's nickel industry stabilized between 1971 and 1976. Underlying this apparent stability were two important trends, one involving changes in provincial government policy, the other involving changes in Inco's corporate strategy.

Government policy began to change in 1969 when a newly elected New Democratic Party (NDP) government initiated a major review of its mining policy. Inspired by the Carter Commission's attack on tax concessions to the mining industry, the new government increased the mining tax rate from 9 per cent to 15 per cent of profit, eliminated the three-year 50 per cent tax reduction for new mines, and tightened lease provisions. In 1971 it created Manitoba Mineral Resources, a crown corporation mandated to undertake exploration and develop new mines. With an ironic appreciation of the example provided by private mining companies, the resources minister justified his government's entrepreneurial initiatives:

> The Manitoba Government has decided to follow the example of the private mining corporations. It is presently holding in trust for the people of Manitoba a substantial acreage of unstaked potential mining properties. Like the mining companies, it will try to retain control of this potential source of mineral wealth. By retaining control of this source of wealth, it will hope to have maximum flexibility in deciding as to when and under what circumstances it will be developed. In the development of these potentials it will hope to retain as much of the returns for the people of Manitoba and to pay as little as possible to other persons. This is good business sense and we appreciate the example of the private mining companies who have

> shown us the way (Green 1972, cited by Owen and Kops 1979).

Eric Kierans, an economist and former president of the Montreal Stock Exchange, was subsequently commissioned to prepare a new comprehensive mineral policy. Kierans' Report (1973), concluded that mining companies' royalty rates were unjustifiably low. He recommended what amounted to a five-fold increase in tax rates to be achieved by replacing the 15 per cent profit-based system with a 15 per cent ad valorem system, combined with a gradual nationalization of the entire industry (Kierans 1973). Wary of the sweeping changes recommended by Kierans, the government set up a task force to review his proposals (Manitoba 1974). It recommended an increased role for government, stricter management of private mining, and higher taxes based on a volumetric system; but it rejected Kierans' proposals for phasing out the private sector role in mining.

The rapid rise in commodity prices in 1973 and 1974 convinced the government to act. In 1974 it increased the income-based tax rate from 15 per cent to 23 per cent and, in 1975, introduced a completely new mineral taxation system designed to collect a "fair" return from the province's mineral resources. It was calculated as follows (Cairns 1977; Yul Kwon 1983). An investment base was defined each year by estimating the current value of all mining assets (adjusted for inflation), new capital expenditures, and depreciation. Mining profits were calculated as revenue less all operating expenses, excluding interest and depreciation. Then, taxable profits were calculated by deducting depreciation based on the historical cost of mining assets and a processing allowance (based on 8 per cent of the undepreciated book value of processing assets). Taxable profit was divided between normal profit (any return up to 18 per cent of the investment base) and surplus profit (any return over 18 per cent). Normal profits were taxed at a rate of 15 per cent and surplus profits at 35 per cent. To take into account cyclical fluctuations, a three-year averaging formula was used. A "husbandry" provision was enacted which gave the minister the right to regulate directly a mining firm deemed not to be operating in the public interest.

Although this new mining tax was an innovative attempt to collect rent while leaving the producer a fair return, it had several major flaws. It taxed normal profits at 15 per cent, thereby discouraging marginal investments. This problem was compounded by inadequate allowance for carrying forward preproduction investment and losses. While these inadequate carry-forward provisions did not pose major problems for companies like Inco, which could deduct investments from existing cash flow, they were an impediment to any new firm unable to deduct development costs until its mine began generating cash flow (Cairns 1977; Yul Kwon 1983). Also, the 8 per cent allowable deduction on processing assets was less than the real cost of capital. A third deficiency – which in part compensated for the first two – was that the tax allowed for a real return (after inflation) of 18 per cent on total mining assets, before taxing profits at a higher rate. Because the 18 per cent return was well above the costs of capital, and because the government allowed a firm to retain 65 per cent of returns over and above the 18 per cent, the tax collected only a small share of rent. Despite its innovative features, the new mining tax therefore failed to achieve its objective of being a neutral rate-of-return tax.

To complement changes to the royalty system, the government also revised the mining regulations (Owen and Kops 1979). Length of leases were reduced, and work requirements necessary to maintain a lease were increased. As well, the crown obtained the right to participate in any major exploration program. Although the government and private sector could mutually agree to any share, the regulations limited maximum compulsory government participation to 50 per cent of the joint venture.

While Inco was undoubtedly distressed by the more aggressive stance of the Manitoba government, it was more concerned by another ominous trend in the world nickel industry. As Main (1955) illustrated, Inco's control of nickel deposits, patents on technology, and marketing were entry barriers which maintained its market power. Two technological breakthroughs in the 1960s – one permitting more efficient processing of laterite ores and the other permitting use of Class II ferronickel, predominately from laterite ores, in production of stainless steel – made the more plentiful laterite ores competitive with Inco's sulphide ores (World Bank 1979). The major entry barrier was thus eliminated. At the same time, shortages pushed nickel prices to levels which made the development of higher cost laterite ores economical. The result was an erosion of Inco's market power (Table 1) and a substantial increase in new capacity (Table 2).

Inco could have responded to this trend in several ways. It could temporarily have cut prices in the late 1960s to discourage new investors from risking the high fixed costs required to enter the industry. Although Inco attempted to moderate the price rise by rationing nickel among its customers, its demand forecasts suggested consumption would be strong enough to accommodate new entrants; and furthermore, Inco did not have sufficient production capacity to maintain a significant price cut. Inco could have allowed its market share simply to decline. This strategy would have eliminated Inco's position as the price-setting oligopolist. Or, Inco could aggressively expand its own capacity to maintain market share. Operating at full capacity and projecting continued strong growth in nickel consumption during the 1970s, Inco opted for the last approach.

Table 1
World Nickel Production by Major Producers
(per cent)

Company	1955	1970	1980
Inco	67	44	34
Societe Metallurgique de Nickel (SLN)	5	11	9
Falconbridge	9	7	9
Western Mining	-	3	7
Sherritt Gordon	7	2	3
Other	12	33	41
	100	100	100
Share of market by leading four producers	88	65	59

Source: World Bank 1979, 24; Ainsworth 1983.

As Figures 3 and 4 illustrate, Inco initially expanded in Canada, building three new mines in Manitoba to increase Manitoba's capacity to 170 million pounds per year (Inco 1968). Two of these mines, however, were put on a standby basis in 1971 shortly after they opened, and Manitoba's production did not expand as anticipated. At the same time, Inco negotiated to

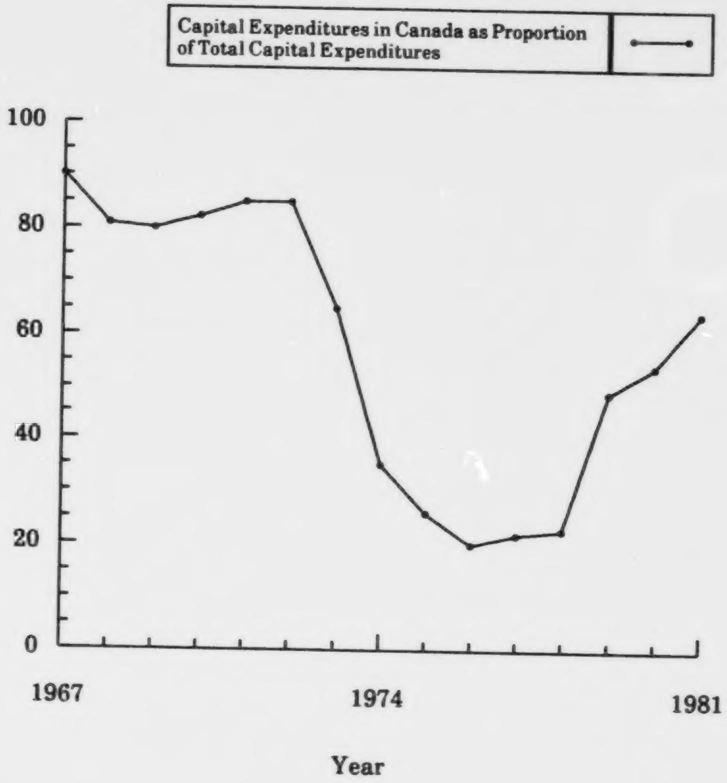
Table 2
Selected Characteristics of Major Integrated Nickel Producers

Company	Location	Ore type and product	Estimated Smelter/ Refinery capacity 1983 (millions of lbs)	Date Opened
Inco	Ontario	Sulphide Class I and II	300	1887
SLN	New Caledonia and France	Laterite Class I and II	145	1912
Falconbridge	Ontario and Norway	Sulphide Class I	100	1930
Inco	Manitoba	Sulphide Class I	120	1961
Western Mining	Australia	Sulphide (diversified)	65	1967
Falconbridge	Dominican Republic	Laterite Class II	60	1971
Amax	Mines in Bostwana and Refinery in U.S.A.	Sulphide Class I (Amax also processes some laterite ores)	88	1972-1974
Larco	Greece	Laterite Class II	40	early 1970s
Greenvale	Australia	Laterite Class II	46	1974
Marinduque	Phillipines	Laterite	45	1974[1]
Inco	Guatemala	Laterite Class II	25	1978[2]
Inco	Indonesia	Laterite	75	1979
Other	--	--	226	

[1] Closed 1983.
[2] Closed 1981.

Source: Ainsworth 1983, 44-53.

Figure 4
Inco Capital Expenditures by Geographic Area
1967-1981



Source: Ontario 1977, 105; United States, annual.

develop new laterite mines in New Caledonia, Guatemala, and Indonesia. In 1973 it launched a project with a capacity of 25 million pounds in Guatemala, and a project in Indonesia with a capacity of 35 million pounds (Inco 1973).

The decision to develop these laterite mines in Indonesia and Guatemala while surplus capacity existed in Canada was based on a number of factors summarized by J. Edwin Carter, chief executive officer of Inco, in his submission to the Ontario legislature (1977). Carter maintained that new laterite projects were essential to meet forecast demand. Inco was simply pre-empting other potential developers. As well, Canadian governments prohibited Inco from exporting unrefined Canadian nickel matte; the Indonesian development was designed to export nickel matte to Japan. Inco also expressed concern about the more aggressive demands of the Manitoba government for a higher share of revenue. "Such high taxation," warned Inco, "can only deter new mining investment and expansion in the province." (Inco 1970, 1). Diversifying its operations obviously reduced that risk.

Just as Inco was embarking on these two major projects in 1973, rising energy prices dramatically increased the relative cost of the more energy-intensive laterite refining process (see Table 3). This problem was compounded by falling nickel prices resulting from declining demand. Postponement of at least part of Inco's expansion was still feasible up to 1975, at which date Inco began the second stage of its Indonesian project involving an additional 65 million pounds of annual capacity (Inco 1975). Nonetheless, Inco continued development of this increasingly risky laterite project despite rapidly deteriorating market conditions. In 1974 Inco also diversified by purchasing a battery operation in the United States. All three investments proved costly errors.

Decline, 1977-1985

After the period of relatively stable output, 1971-1976, Manitoba's nickel industry entered into rapid decline. This prodigious decline was not due to normal market factors. Average world consumption during this period was at unprecedented levels and, as Figure 1 illustrates, Manitoba remained among the world's lowest cost producers, with approximately a 35-year supply of reserves and ample capacity. As well, a "free enterprise" Conservative government, elected in 1977, revoked the NDP's interventionist policies and established one of the more generous mineral royalty systems in Canada (Parsons 1982). Under these conditions, one would expect

Table 3
Estimated Unit Cost of Nickel Production in Selected Countries, 1973 and 1974

Country	Ore Type	Net Cash Operating Cost (U.S. cents per lb.)		Per cent Increase
		1973	1974	
Canada (Inco)	Sulphide	66	69	4.5
Canada (Falconbridge)	Sulphide	85	92	8.2
Australia	Sulphide	83	92	10.8
New Caledonia	Laterite	105	126	20.0
Dominican Republic	Laterite	74	105	41.9

Source: World Bank 1979, 53.

Manitoba's output to increase, not decline. Indeed, two other low-cost sulphide producers (Western Mining and Falconbridge) maintained their market share, while Manitoba's declined from 11 per cent in 1977 to less than 6 per cent in 1982.

The explanation for this anomaly lies in the behaviour of Inco and the institutional structure of the nickel industry. As previously noted, Inco played the role of price-setting oligopolist by restricting supply to maximize long-term profits. While this strategy was successful in generating above-average returns for Inco, it reduced its market share. Technological changes in the 1960s, combined with high prices, increased the quantity of nickel supplied by other producers. (In terms of Figure 2 the marginal cost of other producers fell, increasing their output and reducing Inco's residual demand curve). Inco compounded the problem by developing two new laterite mines, surplus to world needs.

Faced in 1976 and 1977 with rising nickel inventories and weak markets, Inco restricted output at its Ontario and Manitoba operations to accommodate anticipated production from its two new, high-cost mines. This cutback, combined with a recovery in demand, resulted in a recovery of prices between 1978 and 1980. Nonetheless, Inco incurred operating losses at its two new mines while unused capacity existed at its lower-cost Canadian mines

(Table 4). Part of the reason for this seemingly irrational strategy was that the output of refined Class I nickel from Inco's Canadian operations was not a perfect substitute for the nickel matte from Indonesia (which was largely dedicated to the Japanese market) and Guatemala. And Inco feared that production cutbacks in Indonesia and Guatemala could result in nationalization. As Chief Executive Officer J. Edwin Carter stated:

> Since Inco made its production curtailment announcements (for Canadian mines), some people have suggested that the company simply shut down and walk away from its commitments in Indonesia and Guatemala until the current market situation has improved. To have Canada's largest mining company defaulting on undertakings of the magnitude and complexity of the Indonesian and Guatemalan projects is clearly unthinkable. Neither would it be consistent with Canada's international position as a developed country committed to helping developing countries, nor with maintaining the company's position as the free world's largest supplier of nickel. Finally, a default by Inco would not cause the projects to shut down. The lenders, or perhaps the governments of countries involved, would step in to complete the facilities and ensure that they would be able to produce. Inco's equity would be lost, and then lenders would be free to offer the facilities at a discount price to prospective buyers whose low capital cost would permit them to compete very successfully in world markets (J. Edwin Carter 1977, 16).

When markets weakened in 1981, Inco finally closed its Guatemalan mine. By 1982 a combination of weak markets aggravated by Inco's surplus capacity, high debt servicing charges, and operating losses on its Guatemalan and Indonesia mines (as well as its battery division) drove Inco to the verge of insolvency. A gradual recovery in nickel markets, productivity improvements, and adept financing averted financial collapse.

The market is currently in a transition from a dominant firm oligopoly to a more traditional oligopoly in which all the leading firms will have to use their combined market power to earn monopoly rents. With its reduced market share, Inco is no longer willing to bear sole burden of supply management. Although the nickel industry remains one of the most concentrated industries (World Bank 1979), impediments such as

Table 4
Selected Data on Inco Mining Operations
1977-1984

	Canada	Indonesia	Guatemala
Production Capacity (millions of lbs.)	420	75	25
Capital cost (nominal US$)	n.a.	800	220
Production (millions of lbs.)			
1977	417	--	--
1978	263	--	4
1979	222	19	14
1980	334	45	15
1981	284	44	closed
1982	171	30	--
1983	243	40	--
1984	309	50	--
1985	286	48	--
Operating Profit (nominal US$)			
1977	135	--	--
1978	138	--	--
1979	316	(27)	n.a.
1980	537	1	n.a.
1981	251	(14)	closed
1982	(94)	(38)	--
1983	(108)	(69)	--
1984	101	(33)	--
1985	176	(17)	--

Source: Ainsworth 1983; United States annual.

surplus capacity, high fixed costs, Third World government pressure, and U.S. antitrust policy make the establishment of an effective oligopoly difficult (Cairns 1984).

Nickel Rents

One of the principal objectives of this volume is to measure the generation and distribution of natural resource rents. As Cairns (1983) emphasizes, measurement of rent is difficult. There is rarely a well-functioning market for in situ natural resources. Rents therefore have to be estimated by indirect methods such as examining corporate financial data to determine the surplus returns to factors of production. Unfortunately, there is little agreement on what constitutes "normal" returns to factors of production, and appropriate financial data are rarely available.

Studies of rent in the mining industry have dealt with these problems in various ways. Kierans (1973), in his study for the Manitoba Government, estimated rent from various financial ratios. Although he concluded that the mining industry was earning high profits and paying low taxes, he did not deduct the cost of capital, and therefore did not estimate rent.

Copithorne (1979) estimated rent as the difference between value added in the primary industries, less the opportunity cost of capital and labour. Opportunity cost of labour was estimated as the average wage in manufacturing, while cost of capital was defined as the yield on industrial bonds. By using manufacturing wages as opposed to actual wages in the primary sector, Copithorne attempted to include resource rents which may have been passed on to labour in terms of higher wages. Based on 1970-1973, and using Statistics Canada data, he estimated the annual, average resource rents in the Manitoba mining industry to be $283 million per year (1985 dollars). No attempt was made to assess the distribution of rent between government, labour, and producing firms.

The most comprehensive estimate of nickel rents was completed by Cairns (1982). Unlike Copithorne's and Kierans' work which examined rent generation over a limited time horizon, Cairns estimated the net present value of each mining project over an extended period of operation. Net present value was calculated by a discounted cash flow analysis based on data in corporate annual reports. The opportunity cost of capital was adjusted to reflect the risk for each individual mining firm. Cairns also attempted to distinguish between monopoly rents arising from market power of Inco and differential rents arising from different quality of ore bodies. Cairns estimated Inco's nickel rents, discounted back to 1961, to be $1,359 million, of which $944 million was differential rent and $415 million monopoly rent. Cairns was unable to disaggregate rent by division or geographic area.

The approach in this study is similar to that of Cairns. A discounted cash flow analysis of Inco's Manitoba division has been conducted for 1961-1981 based on unpublished financial data. Net cash flow by year is defined as net income of Inco's Manitoba division before tax, interest, and depreciation. Exploration expenditures devoted to finding the Thompson ore body, as well as ongoing exploration and capital expenditures, were deducted as a net cash outflow in the year incurred. A real, before tax opportunity cost of capital (or discount rate) of 10 per cent was used. Although the detailed calculations cannot be reproduced because of the confidential nature of the data, the study concluded that the forward value[1] of Inco's Manitoba operations turned positive by the early 1970s. All subsequent net cash flow has been rent.

While data on the cash flow of Inco's Manitoba division are not available publicly, it can be estimated by using Canadian "operating profit" figures published by Inco in its annual reports. Inco defines operating profit as net income after all operating expenses excluding interest, some general corporate expenses, general corporate income, equity earnings of affiliates, and currency translation adjustments. Depreciation, depletion, exploration, research and development are all included as operating expenses. Inco's definition of operating profit differs from net cash flow as defined above in two, offsetting ways. Operating profit is calculated by deducting depreciation and depletion which are accounting deductions not affecting cash flow, yet not deducting ongoing capital expenditures required to maintain assets. Based on data for 1961-1981, depreciation and depletion charges slightly exceed capital expenditures; therefore Inco's "operating profit" slightly underestimates cash flow.

Operating profit figures and other key financial data for Inco's Canadian division for 1977-1981 are summarized in Table 5. To estimate Inco's Manitoba operating profit (which is not published), Inco's Canadian data are prorated by Manitoba's share of Inco's aggregate Canadian sales and taxes. This assumes that profit and tax rates for Inco's Manitoba division are similar to the Ontario division, an assumption confirmed by Inco and Federal Department of Energy and Mines analysis (see Figure 1). The results of these calculations are shown as Case 1 in Table 6.

Potential rent has been estimated on the basis of two adjustments. If Manitoba's nickel industry had been operated by a separate, profit-maximizing firm, like the two other low-cost sulphide producers (Western Mining and Falconbridge), instead of by Inco, it is assumed that Manitoba would have maintained its market share. With this first adjustment, Manitoba could have realized, between 1977 and 1981, an output equivalent to the lower of full capacity utilization – defined as 85 per cent of the peak output of 140 million pounds in 1970 – or 13 per cent of market share. Between 1977 and 1981, this would have increased average annual production from 85 million lbs. to 119 million lbs. This is probably a conservative adjustment because, even at this higher output, Manitoba's market share would still have declined from 13 per cent of world consumption to 10 per cent. The resulting 2 per cent increase in world supply would have had only a minor impact on price. The results of higher Manitoba output on nickel rents is shown as Case 2.

Table 5
Selected Inco Financial Data, 1977-1981
(millions of 1985$)

	Canadian Operations			Manitoba Operations
	Sales	Operating Profit	Taxes	Sales
1981	1856	371	114	275
1980	2202	856	357	328
1979	1890	562	236	491
1978	1920	264	111	398
1977	1730	256	84	256
	9598	2309	902	1748

Source: Sales, operating profit, and taxes are taken from Inco 1982. Manitoba sales were obtained from the Dept. of Energy and Mines, Government of Manitoba. All data have been converted to 1985 dollars by the GNE price index.

Cases 1 and 2 both assume that Inco's Manitoba division operated efficiently. But Inco's performance suggests the existence of rent dissipation through "X-inefficiency" (see discussion in Chapter 1). Most of Inco's major investments in the late 1960s and 1970s were with hindsight costly errors. Also, Inco did not pay close attention to production costs until 1982 when low prices and high debt servicing necessitated productivity improvements to maintain solvency. After remaining relatively stagnant throughout the 1970s, Inco's real costs per unit of output declined by 25 per cent between 1982 and 1984, with a further 25 per cent improvement forecast during the next several years (Baird 1984). These gains were achieved largely by more extensive use of well-known techniques such as bulk mining, conveyors, electrification, and computers, and could have been realized earlier. As William James, president of Falconbridge, candidly admits:

Table 6
Annual Manitoba Nickel Rents
(Millions of 1985$)

	Actual Rent	Potential Rent		
	Case 1 (Actual Rent)	Case 2 (Higher Output)	Case 3 (Higher Productivity)	Case 4 (Higher Output and Higher Productivity)
1) Revenue	371	519	371	519
2) Costs	280	392	210	295
3) Rent (1-2)	91	127	161	224
4) Taxes Collected	35	35	35	35
5) Uncollected Rent (3-4)	56	92	126	189

> . . . who was complaining about high production costs when you could sell all the nickel you produced at a reasonable profit? And if productivity was going down, why be concerned when the price was going up?. . . And back in the old days, we could afford it. Were our work forces too large? Did we have too many miners, too many managers, too many geologists and

> engineers? By today's standards, yes, we did. But by the standards prevailing at the time, we did not. They were luxuries, but they were affordable luxuries. (James 1985, 109).

The second adjustment used in this study is an assumption that the 25 per cent productivity gains achieved between 1982 and 1984 could have been realized earlier, from 1977 to 1981. The results are shown as Case 3. Case 4 includes both adjustments.

The results summarized in Table 6 illustrate that observed annual nickel rent (Case 1) is about $91 million per year and that the two levels of government captured $35 million or 38 per cent. After adjustments for higher output and improved productivity gains (Case 4), the annual nickel rent estimate is $224 million. Actual government taxes comprise less than 16 per cent of this amount.

Medium to long-term nickel prices are expected to be similar to the 1977-1981 average (Canada 1984). Operating costs have already declined about 25 per cent and are expected to decline even further. Demand forecasts and reserve estimates indicate that Manitoba should be able to increase its market share (Canada 1984). Subject to these assumptions, future annual nickel rents should be between the estimates in Case 3 and Case 4.

Another measure for evaluating the impact of Inco's behaviour on Manitoba is employment. While this measure is not justified on economic efficiency grounds, the importance attached to employment by government justifies its consideration. The curtailment of output below a level commensurate with Manitoba's comparative advantage, combined with the failure to capture potential rents which could in turn have been used to stimulate provincial economic activity, have cost Manitoba between 7,800 and 9,600 jobs. (See Appendix 2 for more detail).

Policy Options

Manitoba has relied on lease regulations and mineral taxation to manage its nickel resources. As the foregoing analysis shows, this approach has not been effective in maximizing or collecting nickel rents. Although recent changes in Inco's corporate strategy could increase the effectiveness of existing policy, a review of provincial nickel policy is clearly in order.

Alternative policy instruments are analyzed in the Appendix to Chapter 1. The general conclusion is that under conditions of perfect competition competitive bidding can be an effective approach for allocating uncommitted natural resource rights. Inco's control of most of the province's nickel deposits and the oligopolistic structure of the industry greatly diminish the efficiency of bidding.

A second approach is to alter the mining tax to capture a larger share of rent. It is difficult, however, to design a tax which can capture a large share of rent without causing distortions. A tax is also incapable of ensuring that Inco increases output to a level commensurate with Manitoba's comparative advantage.

A third option is for the government to use its taxing powers and ownership of nickel to encourage Inco to sell its Manitoba assets to an independent company which would operate them as a separate profit-maximizing entity, thereby freeing Manitoba from an inefficient price-setting oligopolist. The government then could implement an improved royalty to capture rent while relying on the new, profit-maximizing firm to increase output to a level commensurate with Manitoba's comparative advantage. This option would be difficult to implement. Furthermore, if the structure of the industry continues to evolve into a more traditional oligopoly in which Inco no longer plays the price-leadership role, divestiture may not result in higher output.

A fourth option is a government marketing board making the entrepreneurial output decision and treating Inco's Manitoba operations as a supplier subject to a regulated return on capital. Inco would sell a contracted level of output to a provincial marketing board at a price covering costs and a normal return to capital. The marketing board would resell at the prevailing market price and capture rent as the difference. By tough exercise of its monopsony power, such a marketing board might negotiate purchase agreements which force Inco to improve productivity. The marketing board would improve the government's bargaining position with Inco by increasing the public sector's entrepreneurial ability and by providing strategic information. This would reduce the threat of investment strikes and intracompany transfers. Despite these advantages, a Manitoba nickel marketing board has the weaknesses of any regulatory board, including the threat of "industry capture" and distortions caused by price controls. Inco would still have a strong bargaining position by virtue of its control of production assets in the province and its potential to shift production out of the province.

A final option is for Manitoba to purchase Inco and operate it as a profit-maximizing crown corporation. In principle, this would allow Manitoba to expand its market share and capture rents. The crown corporation would eliminate the problem of bargaining with Inco over output levels, prices, and investment decisions; and it would allow the province to develop some of the production linkages in Manitoba, such as head office management, and research and development functions. One problem with this approach is that some rent could be capitalized in the purchase price. Also, as the study of hydro utilities shows, crown corporations can exhibit the same tendencies as Inco, dissipating rent through surplus capacity and high production costs. Nonetheless, public ownership is probably the most effective way of achieving provincial objectives.

The foregoing policy options were discussed within the context of Manitoba's interests as a small producer forced to play a price-leadership role, even though its own output has little impact on price. If the context is extended to the Canadian interest, the policy options are more complex. Canada's position in the nickel industry is similar to Saskatchewan's in potash. Therefore, Canada may benefit by playing a price-leadership role in the nickel industry similar to the one proposed by Richards for the Saskatchewan potash industry (see Chapter 4). Such a role would require direct control over the entire Canadian nickel industry to maintain output at long-term, profit-maximizing levels.

Conclusions

Manitoba is one of the lowest-cost nickel producers in the world and has enough low-cost reserves to sustain output well into the next century. Despite these advantages, Manitoba's nickel industry has experienced a rapid decline. Output and employment declined by a half during the 1970s. This paradox can only be explained by Inco's behaviour as a price-setting oligopolist.

During the 1950s and 1960s, Inco pursued the profit-maximizing strategy of restricting output to maintain high prices. The resulting high prices and technological changes made the more plentiful laterite ores competitive with Inco's sulphide ores and allowed new firms to erode Inco's market share. In response, Inco diversified into new product lines and new high-cost mines in the Third World just as markets began to weaken. Faced with surplus capacity, Inco cut back at its Thompson and Sudbury operations while continuing to produce at its higher-cost operations in Indonesia and in Guatemala.

The strategy was costly to both Inco and Manitoba. By 1982 Inco's losses drove the firm to the verge of insolvency. Manitoba has borne the full costs of oligopoly while receiving only a small share of the benefits. As the performance of Western Mining and Falconbridge illustrate, if Manitoba's industry was operated as a separate profit-maximizing corporation, Manitoba's output and nickel rents could probably have been substantially higher.

While changing market structure and improved productivity may mitigate problems in future years, changes in provincial nickel policy are warranted. At a minimum, Manitoba should increase its share of nickel rents by strengthening the mining tax system. This could be accomplished in a number of ways, including increasing the tax rate in the existing mining tax system. The government should also consider more direct measures to control production, such as a marketing board or public ownership. If the objective is to maximize Canadian nickel rents, some cooperative strategy with Ontario will be required.

In general, the Manitoba experience provides some valuable lessons for natural resource policy. It shows that resource owners should consider the market strategy of individual firms in evaluating alternative resource developers. Although development by a leading firm may appear preferable for reasons of superior technology, marketing ability, and proven performance, a smaller firm or crown corporation may be superior if the market structure is oligopolistic and if the leading firm is playing the role of price-setting oligopolist. Also, retention of rents by the resource developer can result in inefficiency; the alleged trade-off between rent collection and efficiency is a misleading simplification. And failure to collect rents can reduce regional economic growth and employment, as rents are leaked from the economy to compensate foreign shareholders or to finance developments in other jurisdictions. This can occur even if opportunities exist within the region. Finally, the Manitoba experience illustrates the importance to policy-making of timing. In 1975 a more aggressive rent-collection regime was implemented in response to the commodity boom of the early 1970s. These policies failed to capture rent during that boom, while appearing to aggravate the industry's problems during the 1975 downturn. Manitoba then removed the initiatives before the next upturn, in 1979 and 1980, when they would have been effective. To be effective, policy must be developed in anticipation of events.

APPENDIX 1
Selected Nickel Data
(millions of lbs.)

Year	Manitoba Production	Inco Production					Western World Consumption
		Manitoba Division	Ontario Division	Indonesia Division	Guatemala Division	Total All Divisions	
1970	156	141	360			501	980
1971	154	136	327			463	830
1972	132	115	286			401	950
1973	150	132	337			469	1210
1974	130	119	391			510	1270
1975	139	130	330			460	960
1976	119	108	354			462	1120
1977	117	112	305			417	1070
1978	77	77	186		4	267	1190
1979	81	81	141	19	14	255	1330
1980	88	88	246	45	15	394	1170
1981	68	68	218	44	--	330	1050
1982	57	57	114	30	--	201	975
1983	72	72	171	40	--	283	1100
1984	90	90	219	50	--	359	1260
1985	86	86	200	48	--	334	1220

Source: Manitoba data from Dept. of Energy and Mines, Government of Manitoba. All other data from United States annual. Ontario division output is estimated as the difference between total output and output of Inco's other divisions.

APPENDIX 2

Effect of Inco's Corporate Decisions on Manitoba Employment

(all figures rounded to nearest 100)

	Actual Manitoba Employment		
	Direct	Indirect	Total
Production-Induced Employment	2700[1]	2400[2]	5100
Fiscally Induced Employment	1000[3]	500[4]	1500
Total	3700	2900	6600

	Potential Manitoba Employment		
	Direct	Indirect	Total
Production-Induced Employment	2800-3700[5]	2500-3400[2]	5300-7100
Fiscally Induced Employment	6400[6]	2700[4]	9200
	9200-10100	5200-6100	14400-16200

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[1] Average direct Inco employment in Manitoba, 1977-1981

[2] Based on multiplier of 1.9 as developed in Nickel (1978, 22).

[3] Calculated on basis of annual collected rent estimate of $35 million in Table 6. Dollar figures have been converted to employment figures on the basis of $33,000 per job which is the 1983 employment to GPP ratio reported in Conference Board of Canada (1984).

[4] Based on government expenditure multiplier of 1.5 estimated in Miller and Wallace (1983).

[5] Employment based on average 85 per cent capacity utilization during 1977-1981. Low figures assume employment/output ratio is reduced by 25 per cent reflecting efficiency gains, while high figures assume actual employment/output ratios.

[6] Calculated on basis of annual, potential rent of $224 million in Table 6.

Notes

1. See note 1 to Chapter 1 for an explanation of forward value.

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Chapter 4:

The Saskatchewan Potash Industry: An Exercise in What Could Have Been

John Richards

> Nothing but growth lies ahead. . . .
>
> Thomas Ware, president of large fertilizer mining company, Saskatoon, 1965 (address to a conference on potash – at height of initial investment boom and three years prior to collapse of North American fertilizer market).

Ever since the coincidence in the 1930s of three major economic crises – the end of the prairie agricultural frontier, world depression, and drought – a pervasive theme of political and economic discussion has been that the Western Canadian economy relies excessively on a few primary, "staple" industries and that diversification via more secondary manufacturing is a high priority. Without denying the value of judicious investment in manufacturing, in many cases the comparative advantage in the primary sector has been so large that, despite the undeniable problems of staple-based economies, public policy should have been *less* concerned with diversification and *more* concerned with developing staples rationally. One obvious measure of the costs of poor planning in the staple sector is forgone economic rent. Due to poor decisions by both private and public actors, a large amount of rent has been forgone. Saskatchewan potash will serve as a case study.

Begin with the following question: During the initial "potash boom" of the 1960s, how much economic rent could have been realized from Saskatchewan potash reserves? Although the question is straightforward, its answer entails a fairly complex, hypothetical exercise involving a set of assumptions, many of which are admittedly subject to challenge.

The forward value of rent, from 1964 to 1977 (capitalized to 1977) is estimated to have been $849 million. (All figures are in 1985 Canadian dollars.) The analogous value of capitalized rent over this period could have been 2.5 to 4.5 times greater. Another way to appreciate the relative magnitude of potash rent is to consider the contribution potash rent made to increased per capita income in Saskatchewan. (Obviously Saskatchewan residents did not, and could not, capture all rent. Some accrued to the potash companies as profit, and both the federal and provincial government subsidized development through special tax and royalty provisions.) Of the capitalized per capita income *increases* that Saskatchewan residents achieved from 1964 to 1977 (compared to the base year 1963), observed, capitalized per capita potash rent comprised 3.1 per cent. Rent could have been 7-13 per cent.[1]

Introductory Considerations

"Potash" is a commercial expression applied to compounds containing the potassium ion in a form accessible to plant nutrition. In Saskatchewan, the potash ore mined is a mixture of sylvite (potassium chloride) and common table salt (sodium chloride). Over 90 per cent of the commercial production of potassium is in the form of potassium chloride. Also over 90 per cent of potash is used for agricultural fertilizer, potassium being the third major element – after nitrogen and phosphorus – in which cultivated soils become deficient.

The first evidence of potash deposits in the Canadian prairies came in 1914. Reporting the results of their analysis of Manitoba slough waters in the Canadian *Geological Survey* that year, two researchers noted that "the percentage of potash in the total solids is . . . unusually high – much higher than in most of the waters which have been investigated for potash on this continent." They supplemented their geology with a few relevant political comments: "The fact that a powerful monopoly has been established in the potash industry renders it difficult to forecast the success of a venture in this field . . ." (MacLean and Wallace 1914, 169). The monopoly at the time was German. The researchers' forebodings about the political difficulties entailed in development of a Canadian industry were prophetic. Their findings were forgotten until 1942 when potash was discovered accidentally in the core of an oil well in southeastern Saskatchewan. The discovery was at 2300 meters, too deep for conventional room and pillar mining techniques. In 1946, potash was discovered again by accident while drilling for oil, this time at Unity, a town approximately 160 kilometers west of Saskatoon. This discovery was at a commercially exploitable depth.

During the following decade, the geology of the Elk Point Basin in which the prairie potash deposits lie became known in the course of exploratory oil drilling. Opening to the sea in what is now northwestern Alberta, the basin covered most of that province and the southern half of Saskatchewan, and extended into Montana, North Dakota, and Manitoba. Evaporation of this inland sea 300 million years ago, in the middle Devonian period, deposited salt beds up to 300 meters thick. Reefs limited the deposit of potash salts to the upper reaches of the basin east of Alberta. South of a line running west-northwest through Prince Albert, potash deposits underlie most of Saskatchewan; they continue into Montana and North Dakota and marginally into Manitoba. Commercially recoverable reserves, virtually all in Saskatchewan, are only a small fraction of this vast volume. Much is too deep; some deposits are insufficiently separated from water-bearing formations to permit safe mining; elsewhere the concentration of sylvite is too low or the concentration of the undesirable potassium salt, carnallite, too high. Below 1000 meters the pressure of overlying strata is considered by most (not all) engineers too great to permit conventional room and pillar mining. Solution mining is not subject to such a constraint (Holter 1969; Saskatchewan Department of Mineral Resources 1973).

An ore body is only included in reserve estimates if its unit production cost is less than the realizable market price of the mineral. Since ore bodies display a range of costs, reserve estimates will rise as a function of the market price. Reserve estimates of many minerals have also tended to rise over time with geological exploration and as technological improvements have lowered unit production costs. At present, potash reserves are large, relative to world consumption levels, and exist in many regions of the world beyond the Elk Point Basin: New Brunswick and New Mexico in North America, Germany (East and West), Soviet Union, Israel, France, Spain, and elsewhere. Saskatchewan reserves are, however, by far the world's largest and, given the high sylvite concentration in level seams, among the cheapest to exploit. Depending upon the market price used, Saskatchewan possesses 40-80 per cent of world reserves. Currently Saskatchewan reserves have a life index (reserves divided by current annual production) that exceeds 1,000 years.

In a competitive market, a typical Saskatchewan producer would receive a price (fob the mine) equal to unit operating cost, plus a prorated portion of the cost of capital invested in the mine. Since, for practical purposes, Saskatchewan reserves can be considered infinite, no scarcity rent would arise. Transportation cost is a complicating issue that would, even under optimal competitive conditions, give rise to scarcity rent—but only on those non-Saskatchewan sources that enjoy in some market a sufficient transport cost advantage to offset any production cost disadvantage.[2]

History of Interest Group Lobbying

Rent has arisen in the Saskatchewan potash industry because the persistent power of special interest groups blocked a competitive market outcome, not because of scarcity. Occasionally interest groups representing fertilizer consumers (farmers) have attempted to break the power of producer interests, but they have never been effective. To appreciate the obstacles to rent maximization, it is necessary to understand the history of interest group lobbying in the industry. It divides into four fairly well-defined stages.[3]

Initial development, 1946-1962

New Mexico was the site of most North American potash production before development of Saskatchewan's reserves. Producers in New Mexico constituted an informal cartel that had maintained stable prices and realized target levels of profitability since World War II. In the 1950s the first major firms to invest in Saskatchewan did so as an extension of their American operations and with the expectation that Saskatchewan development would not disrupt cartel pricing and market conventions. Admittedly Saskatchewan investment entailed substantial uncertainty for the first two producers. They faced complex unsolved engineering problems in shaft-sinking through high pressure, water-bearing strata lying above the potash deposits. Only after solving these problems did it become clear that Saskatchewan unit productions costs were among the world's lowest.

The discovery of commercially exploitable reserves occurred in 1946 during the CCF's first term in office. (The CCF—Co-operative Commonwealth Federation—was the predecessor of the New Democratic Party.) In the mid-1940s the CCF achieved opinion poll ratings in English-speaking Canada comparable to those of the two major parties, but its only electoral victory was in Saskatchewan, Canada's most rural province. A combination of the prolonged market failure of the Great Depression, the experience of wartime government planning, and contact with the British Labour Party had generated a greatly expanded supply of professional planners, economists, and others, sympathetic to state planning and anxious to see elected a government that would use their talents. That the CCF achieved power in only one province severely limited the short run demand for these professionals, but for that very reason the Saskatchewan government was able to realize a level of administrative competence far beyond the contemporary norm for provincial governments. It had both the ideological predisposition and the administrative competence to envision crown development of potash. Initially the cabinet hoped to develop it as a joint federal/provincial venture, but the federal government expressed no interest.

By 1948 the conservative politics of the Cold War were sweeping across North America and private resource firms were generating unprecedented prosperity in post-Leduc Alberta. The two events dramatically undermined public support within Saskatchewan for government intervention in the economy. The provincial cabinet retreated and began "privatization"—the elaboration of rules governing the right to exploit crown-owned potash reserves. The government owned most of the resource; a few private producers possessed the requisite technology to extract and refine it. The government attempted to organize competitive bidding for that right, but was continuously frustrated. Bargaining took the form of bilateral monopoly. Private producers wanted to develop on the basis of binding government guarantees to exclude future competitors and to limit provincial royalties for an extended period. The first producers did not obtain a government-sanctioned monopoly, but did negotiate a contract whereby the government agreed to a low royalty structure and guaranteed not to amend it before 1977 (later extended to 1981). In the 1960s the newly elected provincial Liberal government entered into contracts guaranteeing this royalty structure to all producers. Government violation of the spirit, if not the letter, of these contracts was one basis for litigation by producers when, in the 1970s, the NDP sought to capture a much larger share of rent from the sector.

Potash boom, 1962-1967

From 1962, the first year of continuous Saskatchewan production, until 1967, the year of initial construction of the tenth and, to date, final Saskatchewan mine, a coincidence of factors induced a classic staple boom. Between 1962 and 1970 when the tenth mine came on stream, Saskatchewan potash capacity grew at a compounded annual rate in excess of 25 per cent. Canada became the world's second largest producer, behind the Soviet Union. On the supply side, reasons for the boom were mastery of the technical problems of shaft sinking and the low provincial royalty structure available to producers who invested at the time. On the demand side were two additional factors: a modest boom in fertilizer-using grain markets that increased grain prices, and hence fertilizer applications; and expectations, largely unfulfilled, of aid-financed fertilizer imports by Third World countries engaged in the "green revolution". The boom was of sufficient magnitude to attract new producers without New Mexico mines and independent of the cartel. Viewed with hindsight, growth expectations of both private and public actors in the mid-1960s were absurdly optimistic.

Collapse and resurrection of the cartel, 1968-1973

Agricultural depression in the late 1960s accentuated the over-supply problem (at traditional prices) in the North American potash industry. At the trough, 1969 prices fell, in constant dollars, below half the previous peak of 1965, but given the inelasticity of potash demand, this did little to reduce excess capacity. Some binational producers began shifting production from New Mexico to Saskatchewan.

Depression in the industry activated a New Mexico lobby comprising owners of firms without Saskatchewan mines, union leaders, and state politicians. The lobby's goal was protection against Canadian and European potash imports to the extent necessary to assure a level of demand for domestic potash equal to domestic capacity—at a price enabling "normal" returns to labour and capital in the industry. Initially the lobby sought legislative and executive intervention in Washington. Threat of tariffs and quotas activated in turn the binational producers who generated protection via an alternative route. They prevailed upon the Saskatchewan government to introduce a potash "prorationing" system, based on the precedent of "prorationing" oil and gas production to market demand. Saskatchewan officials cloaked their acts in a specious argument that extended the concept of physical conservation to include "economic waste", a euphemism for sale of a resource at a price below accounting cost.

As introduced in 1970, prorationing established a floor price nearly double the prevailing market level and initially restricted aggregate Saskatchewan production to less than half capacity. In exchange, New Mexico producers informally agreed not to increase production, and the New Mexico government undertook to monitor compliance. Saskatchewan became the residual supplier to the North American market.

The scheme worked as intended. New Mexico production stabilized and the regulated price prevailed. Prorationing succeeded in preventing large capital losses among equity owners of potash mines and delayed the efficient transfer of production to lower-cost Canadian mines. (Due to reserve exhaustion, New Mexico production slowly declined until, by 1984, it was below half the peak levels of the mid-1960s.) Given the high transport costs from offshore suppliers, American farmers in the Midwest (consumers of over one-half Saskatchewan output) had no alternative but to bear the cost of irrational over-investment in the industry. Offshore customers had more options. They decreased their purchases of North American-produced potash and forced producers to cheat on the regulated price by offering hidden discounts.

A counter-lobby of midwestern agricultural interests opposed protection. Their opposition was ineffectual in the short run, but the ramifications of their legal assault on prorationing were far reaching. One Saskatchewan producing firm, jointly owned by Noranda and a large U.S. farm co-operative, launched a court challenge alleging prorationing to be a provincial infringement of exclusive federal jurisdiction to regulate interprovincial and international trade. In 1978, long after the prorationing scheme was defunct, the Canadian Supreme Court ruled in the farmers' favour. This was the first of two crucial cases in which the Supreme Court resolved constitutional ambiguity over resource jurisdiction in favour of the federal government. In the second case, an oil producer claimed that a 1973 Saskatchewan government levy on oil revenue should be considered an indirect tax, not a royalty. The distinction is important because the former was, at the time, reserved exclusively to the federal government, while the latter was, and is, a provincial revenue source. In 1977 the Supreme Court ruled that the contested levy was unconstitutional – a provincial encroachment upon an exclusively federal revenue source.[4]

Potash prorationing was modelled on analogous oil and gas regulation, and the court decision in the first case appeared to jeopardize the constitutionality of virtually all provincial regulation intended to control resource production. The second decision placed in jeopardy the provincial ability to extract resource revenues. The two decisions catalyzed intense provincial lobbying, by Alberta and Saskatchewan in particular, to obtain a political reversal of the legal outcome. The lobbying succeeded when the federal government acceded to a new section, 92A, in the *Constitution Act* (*British North America Act* renamed). It guarantees that a provincial legislature may: exclusively legislate with respect to the exploitation, management, conservation, and development of resources within the province, including their rate of production; legislate with respect to interprovincial, but not international, trade in resources, subject to federal paramountcy in cases of conflict; and raise resource revenues "by any mode or system of taxation", thereby giving the provinces access to indirect taxation of resource industries. (Meekison, Romanow and Moull 1985)

Shifting power within the producer cartel, 1973 –

The early 1970s marked the nadir in Saskatchewan resource regulation. Since the first term of the CCF government, policy had passed from a ministerial commitment to "an orderly change to social ownership" (Phelps, foreword to Hastings, 1945), through a wary acceptance by officials of private capital provided rules assured competitive bidding for crown resource rights, to co-optation of the regulators by the regulated. From the mid-1950s until the early 1970s, resource policy emerged as the result of a bargaining policy within government among different agencies, with officials of the Mineral Resources Department acting as advocates of the perspective of private resource producers.

When they assumed office in 1971, leaders of the Saskatchewan NDP, a left populist party with social democratic leanings, found themselves in the embarrassing role of administrator for a price-fixing cartel. The cartel was preserving the net worth of the primarily foreign owners of equity in potash mines by transferring to fertilizer-buying farmers the cost of excessive capacity. Prior to 1974 Saskatchewan enjoyed neither the employment benefits from displacing New Mexico production that would have occurred under a competitive market, nor a share of the rent created by producer lobbying to restrict output and raise price.

Beginning in 1972 an increase in export demand for North American cereals caused a dramatic increase in fertilizer demand and potash prices. Windfall potash rent ensued. Given nominal provincial royalties and federal taxes, virtually all of the windfall accrued to producers. Saskatchewan residents, the ultimate owners of most of the resource base, received returns averaging three per cent of gross industry revenue. Much of this was in effect payment for public services provided to producers.

While other factors helped break the longstanding tradition of co-opted regulatory practice, undoubtedly the magnitude of forgone rent was the most important reason cabinet in 1974 broke with tradition and introduced the "reserve tax". Constructed by analogy with a property tax (an assessed value multiplied by a tax rate), it was in effect a crude profit tax whose marginal rate approached 100 per cent of incremental revenue under certain conditions (Anderson 1984, 77-80). With its introduction, provincial government revenue from potash exceeded $100 million in 1975, twelve times its 1972 level. Predictably producers alleged the tax regime to be excessive and punitive. For some it undoubtedly was, but producers refused to provide the government with financial data disaggregated by mine to document their case. In aggregate, producers probably retained sufficient revenue to permit normal returns to capital. Less than two weeks after the NDP's re-election in the 1975 provincial election, producers launched additional constitutional challenges to provincial resource policy, claiming provincial potash levies were beyond provincial jurisdiction, for reasons being alleged *mutatis mutandis* by the oil producers. Producers also announced an investment strike cancelling all planned investment.

By mid-1975 the provincial government faced rising economic, political, and legal costs in the use of taxation as a means to redistribute the rent of the potash cartel. Nationalization – "provincialization" is a better term – became a relatively more attractive means to the same end. It meant that rent would not appear in the contested guise of taxes or royalties, but rather as the surplus of a crown corporation. Nationalization had an added advantage to the province by eliminating any federal claim to a share via the corporate income tax; constitutionally, one level of government cannot tax another.

The idea of provincial takeover of the industry was not new. It had been extensively debated within the provincial NDP during the preceding decade. The 1971 NDP election program had contained a commitment to "(e)nd the present (Liberal) government collaboration in a potash cartel. . . . (and to) consider the feasibility of bringing the potash industry under public ownership" (Saskatchewan NDP 1971, 6).

Here is an interesting example of the diffusion of ideas. During both the 1971 and 1975 provincial elections, little public discussion of potash nationalization took place. Once the NDP was elected, officials of the Department of Mineral Resources actively attempted to convince their new political masters of the folly of such a policy. The idea circulated, however, among senior advisers to the cabinet and, when the 1975 crisis emerged, nationalization was for many cabinet members a feasible alternative to taxation. Government leaders were prepared, albeit with trepidation, to assume the entrepreneurial role of determining future investment and market strategy. The cabinet finally concluded that the price of buying entrepreneurship from the private sector was too high.

In response private producers and their local allies launched a major media battle against provincial acquisition of mines. Their counter-attack realized at least some of its objectives. The cabinet scaled down its acquisitions from the original goal of 100 per cent to only 40 per cent. Compensation also was probably more generous than would otherwise have been the case. Furthermore, by 1979 the government negotiated a new Potash Resource Payments Agreement (PRPA) with private producers. The PRPA eliminated former levies, including the controversial potash reserve tax, in favour of a new quasi-rate of return tax that has been estimated as yielding approximately three quarters of the revenue of the former tax regime (Anderson 1984, 84). The PRPA levy is a progressive tax on net producer income – defined as revenue less the sum of operating costs and an allowance for depreciation. Since it is levied before the private producer recovers all capital costs, it does not tax rent alone and therefore is not a true rate-of-return royalty as described in Chapter 1. Despite its concessions, the government retained an important discretionary power in the PRPA tax: the government could decide whether to allow any new capacity as an allowable capital expenditure in calculation of the tax due. If disallowed, a private producer's expansion would be subject to a prohibitive tax burden. Thus the new tax served to assure government control of future expansion.

By 1978, upon completion of government acquisitions, the provincially owned producer, Potash Corporation of Saskatchewan (PCS), found itself the largest potash producer outside the Soviet Union. So long as the NDP remained in office (until 1982), the relationship between PCS and private members of the cartel was analogous to that between Saudi Arabia and the "hawks" within OPEC. Among OPEC members, Saudi Arabia possesses by far the largest oil reserves. When short-term factors have increased the demand for oil and increased spot prices, the "hawks" such as Algeria and Libya have argued for increases in the price of the reference crude, Saudi Arabian light. The Saudis have been consistently cautious, fearing that too high a price would encourage investment in alternative nonconventional energy sources, such as the tar sands and nuclear power. For most of the alternative energy sources, total unit cost exceeds delivered OPEC prices. But unit operating cost is a small portion of total cost, much less than unit capital cost. Once capital investment in the alternative, nonconventional source becomes a "sunk" cost, it will produce at full capacity at any price above its unit operating cost.

PCS officials sought to gain legitimacy for this new corporate entity by obeying past industry conventions on pricing and marketing practices. On the other hand, they recognized that PCS alone was in a position to take a long-term, rent-maximizing stance and that it was PCS's responsibility as an agent of the crown to do so.

While the "hawks" within the potash cartel were delighted to maximize short-term profits by large price increases during the agricultural boom of 1979-1981, PCS officials worried about high prices enticing new entrants into the industry – both offshore and closer to home (e.g. the prospect of a new mine on the eastern fringe of the Elk Point Basin being considered by the NDP government of Manitoba). Prior to 1982, in the boom market following nationalization, PCS launched projects that have increased capacity of the Saskatchewan industry by approximately a quarter (Karvonen 1985). In undertaking this investment PCS officials wanted greater ability to supply boom markets and thereby maintain price below some ceiling – to impose a "limit on greed". PCS officials also worried about the effect of high prices on offshore demand which is much more price elastic than North American demand. In 1981 they announced their intention to quit Canpotex, the offshore marketing agency run collectively by Canadian producers and through which all Canadian offshore potash exports were directed.

The post-1982 agricultural depression put an end to the immediate threat that high prices would attract new entrants. Again the parallel arises with OPEC. Current potash prices (1986) are approximately half their peak level in 1981 (Karvonen, PCS vice-president, personal comment). High prices in the 1970s encouraged investment in non-Saskatchewan sources, including two small mines in New Brunswick. Like Saudi Arabia, PCS has restricted output in an attempt to prevent prices from falling in a depressed market.

Under the NDP, PCS failed to resolve its dilemma: trying to gain legitimacy among the remaining private producers as a bona fide member of the cartel while trying simultaneously to act as the rent-maximizing agent of Saskatchewan residents. The discretionary aspect of the PRPA further confounded PCS's dilemma. Election of a Conservative provincial government in 1982 has resolved the dilemma for the moment in favour of the former role. PCS is back in Canpotex, and government ministers have stated they plan to leave any future major expansion to private producers.

As Flatters and Olewiler (1984) conclude, it is not easy from an analysis of market shares among PCS, private Saskatchewan producers, and other non-Saskatchewan producers to decide which oligopoly model best describes the North American potash industry during the 1970s. At the time of its introduction in 1970, private producers had perceived the provincial government's role in potash prorationing as that of a passive agent who for a nominal "fee" provides effective sanctions on individual producers to permit joint profit-maximizing by Saskatchewan producers, subject to the political constraint of full capacity American production. The logic of the government's post-1973 strategy was that PCS act as a residual monopolist, subject to full capacity American production and the "grandfather" rights of the remaining private producers to historical production levels. However, this was far from being a well defined contract among those concerned. The remaining private producers begrudgingly accepted the government's redefinition of its role. PCS attempted to mollify them by implicitly attaching some weight to private, as well as public, rent capture. As a result, PCS probably has restricted its output compared to that of a "pure" residual monopolist.

Hypothetical Maximization Model

This section describes the rent-maximization model used. While it is somewhat demanding, it provides the reader with the ability to criticize intelligently the results reported in the following section.[5]

During the period from initial discovery of commercially exploitable deposits in 1946 until resolution of all technical problems in the early 1960s, bargaining power, in the absence of federal support for the province, lay overwhelmingly, and probably inevitably, with private mining companies. It is impossible to predict the outcome of more aggressive provincial policies during this period. After successful completion in 1962 of the second mine, the province could have garnered adequate technical information to pursue alternative policies. The exercise will begin with 1964 since it was the year in which a new government came to office. After 1964, assume that the province developed the industry as a crown corporation (call it "Sask Pot"), purchasing the three existing private mines and halting any further private development. An equivalent scenario in terms of investment and output decisions entails the crown and the three extant private producers operating as a cartel, maximizing expected aggregate rent and allocating it in an independent, side bargain.

To be specific, the goal of Sask Pot is to maximize, by choice of values for two control variables in each year, the expected value of discounted net benefits from exploitation of provincial potash reserves. The relevant variables ought ideally to be treated as continuous with respect to time, but data for many are available only on an annual basis. Time is considered therefore in discrete, one-year units. This is not entirely arbitrary since agricultural production has an annual cycle and it is reasonable to model certain random events, such as the weather, in terms of annual shocks to the system. Sask Pot's two control variables are annual level of output and increments to capacity, net investment. The level of output is allowed to vary continuously in any year between a lower bound of zero and an upper bound equal to currently installed capacity. While economies of scale exist in potash mining, their only incorporation is treatment of the capacity increment variable as discrete – multiples of 500,000 metric tonnes of annual capacity. Additional realism would have been achieved had a third control variable – sales – and an accompanying variable – inventory – been introduced. To simplify the model, and due to the absence of easily accessible inventory cost data, this third control has been suppressed by assuming that over the course of any year output equals sales. Data used to calculate operating costs include on-site, but not off-site, storage costs.

The demand for Sask Pot output can be summarized in the following identity:

$$q_t \equiv q_{1t} + q_{2t} - q_{3t} - q_{4t}.$$

Total demand for Sask Pot output in any year, q_t, is equal to the sum of North American demand for potash from all sources, q_{1t}, plus offshore demand for North American-produced potash, q_{2t}, less two leakages: imports of offshore potash primarily along the eastern seaboard, q_{3t}, and production of potash by non-Saskatchewan North American producers, q_{4t}. In offshore markets, North American producers face extensive competition, and demand predictably is more price elastic than in the domestic market.

Within North America, Sask Pot operates as a residual monopolist facing the above leakages. American protectionism is assumed sufficient to assure full capacity demand for U.S. production at the level prevailing in the early 1960s, approximately 2.5 million tonnes (All potash volume figures are given in metric tonnes of K_2O equivalent).[6] The model assumes Eastern seaboard imports to be a function of aggregate North American potash consumption. No allowance is made for New Brunswick production which has come on stream after the period under consideration. Perhaps under the hypothetical assumptions being made, it would have occurred earlier. This is an admitted weak flank to the exercise. Demand functions for each of the two markets, North America (Canada plus United States) and offshore (the rest of the world), have been estimated and then aggregated to obtain the demand for North American-produced potash. Aggregation implies the simplifying assumption of no price discrimination among markets, of one fob-mine price for all customers. Demand functions include as arguments: (1) potash price, (2) index of prices in the respective markets for other fertilizer ingredients which are close complements, (3) a time trend (for North America only), (4) and price indices of fertilized cereals in the respective markets.

In fitting equations, cereal prices turn out to be statistically very significant. Theoretically this is as expected. The derived demand for potash as fertilizer is the overwhelming use for the chemical, and the value to farmers of incremental fertilizer applications depends on the price at which the fertilized crops can be sold. Given diminishing marginal productivity of fertilizer applications, some point exists beyond which the cost of incremental fertilizer exceeds the gain from incremental yield. The higher cereal prices are, the higher fertilizer application will be before that point is reached.

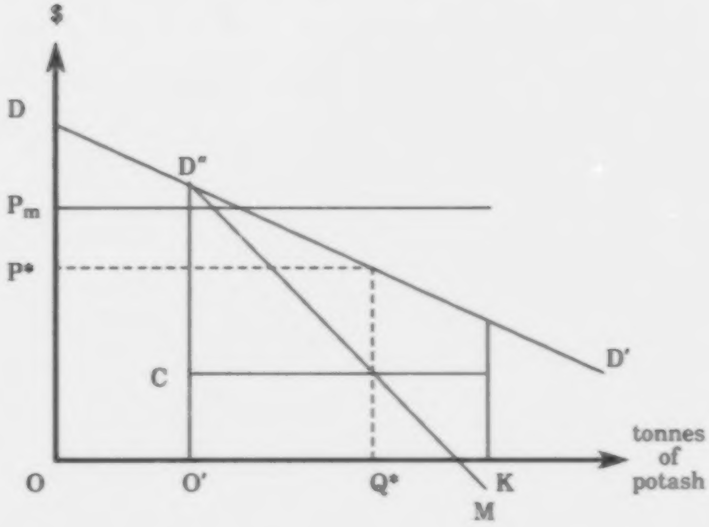
The demand schedule for the other basic fertilizer ingredients depends similarly on cereal prices. Provided supply is not infinitely elastic, their market price will be a function of cereal prices, among other variables. Statistically cereal prices and a time trend explain the movement of nitrogen-phosphorus prices well before the 1973 OPEC price increases.[7] By use of such an explanation, the prices of other fertilizer ingredients can be eliminated from the potash demand equations. The result is a single, reduced form, residual demand equation for Sask Pot. Demand becomes a function of the potash price charged by Sask Pot, time, and cereal price indices in the domestic and offshore markets.

The model adopts a simple, two factor, fixed-proportion production function in which inputs are aggregated into fixed plant and equipment, and a composite of all other inputs. This implies constant unit capital and operating costs, and no ability to substitute between inputs. Sask Pot is assumed to achieve an efficiency equal to the average actually observed in the industry. Sask Pot unit operating cost accordingly is set equal to the mean of observed industry unit operating costs, $42 per tonne (1985$). Similarly unit capital cost incurred by Sask Pot has been set equal to the estimated mean for the nine conventional mines actually built, $440 (1985$) per tonne of annual capacity.[8]

The last preliminary is the limit imposed by the model on Sask Pot's ability to exploit its monopoly status. If market price is unconstrained, the hypothetical exercise implies that Sask Pot reduces production until it realizes prices far above the actually observed upper bound. Should results generated from the upper reaches of the demand function be believed? Such high prices might well trigger large new investments in alternative technologies (such as brine evaporation) and retaliatory political countermeasures from potash importing countries. The model therefore contains a constraint on maximum market price. This admittedly is an ad hoc component of the model. Hypothetical rent is calculated using two different values. One is the highest average annual fob price per tonne actually realized over the period 1955-1977. This maximum was achieved in 1975: $161 (1985$). A second value, designed to curtail Sask Pot's ability to exploit its monopoly status, is the mean of the observed price series from 1955-1977: $120 (1985$).

If Sask Pot planners consider the market-clearing potash price to be the dependent variable in the residual demand function facing them, they must obviously distinguish between Sask Pot production, one of their control variables, and all other variables which are, from their perspective, exogenous. If, as in Figure 1, market price is plotted as a function of Sask Pot production, these latter exogenous variables determine the value of the intercept, O'D". Knowing current values for unit operating costs, O'C, and for the exogenous variables entering the demand function, Sask Pot planners can determine their current optimum rent-maximizing production – subject to an upper bound equal to currently installed capacity, O'K, and to the "limit on greed" in the form of a ceiling on Sask Pot fob-mine price, OP_m. Given the price ceiling as a parameter, current optimum Sask Pot production, O'Q*, here unconstrained, is a function of installed capacity and the current value of the intercept, which in turn is a function of the exogenous demand variables.

Figure 1
Determination of Optimum Sask Pot Production



Legend:

DD': market demand for North American-produced potash

OO': full capacity U.S. production

$D''D'$: residual demand facing Sask Pot.

$O'C$: unit operating (and marginal) cost for Sask Pot.

$O'K$: installed Sask Pot capacity in current year

OP_m: price ceiling ("limit on greed")

$D''M$: additional revenue to Sask Pot from sale of additional tonne of potash, assuming market price on all sales must be lowered to realize additional sales (marginal revenue)

$O'Q^*$: optimum Sask Pot production (at output equating marginal revenue to marginal cost)

OP^*: optimum market price set by Sask Pot.

Were Sask Pot planners to have perfect foresight and know the future values of the exogenous variables, the hypothetical exercise could be reduced to a simple, multidimensional optimization exercise to determine the optimum vector of capacity increments over time. (The dimension of the vector would be the number of years to the planning horizon, investment decisions being made annually.) But to impute perfect knowledge renders the exercise meaningless. Obviously with perfect foresight, excess capacity could have been avoided and rent could have been higher. Uncertainty, particularly with respect to the state of agricultural markets, is central to the problem at hand. Sask Pot planners can make only probabilistic statements about the future. Some relevant variables may be random shocks ("white noise"), the distribution of each observation being completely independent of all other observations. In such cases, knowledge of past values gives no information about the future. For other variables, knowledge of the recent past may permit more accurate forecasts, i.e. future observations are partially random, partially determined by past events. For example, if the last several years have been "good years" with high cereal prices, probably next year's cereal prices also will be high. An elegant way to model such assumptions is to assume, from Sask Pot's perspective, that the key random variables – cereal price indices – are generated by stochastic difference equations. In such an equation, the cereal price in a market in a particular year is a weighted sum of past cereal prices in that market plus a weighted sum of independent random shocks from past years, plus a current random shock. The form of the lag structure and coefficient values can be estimated from past observations, on the heroic assumption that the underlying stochastic process which generates cereal prices does not change. In summary, random phenomena determine the value of the demand schedule's intercept; its slope is assumed to remain invariant.

The appropriate technique for deriving optimum hypothetical values of output and increments to capacity in any year is stochastic dynamic programming (SDP). This technique permits the solution of a broad class of optimization problems involving uncertainty and sequential interdependence. Here the future level of cereal prices is the chief source of uncertainty. Interdependence arises since the optimum capacity increment in any year cannot be specified independently of past and potential future capacity increments. The SDP algorithm used maximizes the net returns to Sask Pot in the current year, plus discounted expected future returns. In turn, the expected future returns are calculated on the assumption that, as future cereal prices are successively revealed, Sask Pot planners will respond optimally.

Saskatchewan potash mines entail a long gestation period between the decision to invest and the mine coming on stream. The model assumes a four-year delay; the first hypothetical decision, made in 1964, will change capacity in 1968. (Of course the optimum investment decision in any year may be to do nothing.) The last decision, in 1973, affects capacity in 1977 and beyond. In each year of the decade 1964-1973, Sask Pot planners hypothetically decide based on knowledge of the current values of installed capacity, and past and current cereal prices.

It is worth re-emphasizing that the algorithm generates sequences of hypothetical capacity increments (and output) without recourse to foresight. The algorithm determines the optimum increment to undertake in any year based on its earlier investment decisions and on knowledge of relevant variables up to the year in question only. More formally, to generate the optimum capacity increment to undertake in any year, t, between 1964 and 1973 the SDP algorithm requires realizations up to and including year t of: North American and offshore grain price indices; the level of capacity on stream when all past capacity increments will have been completed; and since time trends figure in several equations, the index, t, dating the year. The discount rate and price ceiling enter the algorithm as pre-specified parameters.

Simulation Results

Table 1 gives the distribution of rent among three claimants: private producers, provincial government, and federal government. The algebraic sum of rent received by the three claimants equals total rent. A few comments on the rent calculations are in order. (See also notes to Table 1.) Total rent is defined as total revenue less sum of operating cost, capital cost, and tax opportunity cost. Operating cost in the observed case is simply the unadjusted observed costs; in the hypothetical cases it is the average unit cost of $42 per tonne multiplied by the hypothetical level of output. Capital and tax opportunity costs have been calculated on the assumption that a dollar of privately invested capital yields, net of depreciation, 7.5¢ profit and 3¢ corporate income tax per year. These figures are an estimate of average after-tax returns on private industrial capital in real terms after inflation, and an estimate of the income tax generated from that capital, respectively. The reported rent figures are annual flows 1964-1977, capitalized to 1977 at the after-tax annual cost of capital used, 7.5 per cent in real terms.

Table 1
Distribution of Observed and Hypothetical Rent from Saskatchewan Potash Industry, 1964-1977 (million 1985 Canadian dollars)

	Provincial Rent	Federal Rent	Private Rent	Total Rent
Observed rent	612	-756	993	849
Hypothetical rent				
Case A (observed increments; price ceiling: $161/tonne)	2,595	-919	650	2,327
Case B (observed increments; price ceiling: $120/tonne)	1,080	-919	650	811
Case C (discount rate 5 per cent; price ceiling: $161/tonne)	3,572	-646	650	3,577
Case D (discount rate 10 per cent; price ceiling: $161/tonne)	3,672	-621	650	3,702
Case E (discount rate 20 per cent; price ceiling: $161/tonne)	3,741	-567	650	3,823
Case F (discount rate 10 per cent, price ceiling: $120/tonne	2,084	-636	650	2,098

Source: Richards 1982, Tables 7.3 - 7.23.

Notes to Table 1

1. *Federal rent* is negative in the observed case due to subsidies available to the mining sector which reduced tax payments below the tax opportunity cost. The division of corporate income tax between federal and provincial government is approximately 3:1. Federal rent is accordingly defined as three quarters of the difference between actual tax and tax opportunity cost. In the hypothetical cases of development via a provincially owned crown corporation, federal rent is also negative. Because constitutionally one level of government cannot tax another, Ottawa receives no income tax. Admittedly Ottawa might have recuperated some revenue – by reduction, for example, of certain grants to the province – but federal rent is calculated as if it did not.

2. *Provincial rent* in the observed case is defined as provincial levies on the industry plus one quarter of the above difference. In the hypothetical cases, provincial rent is residual: total revenue less the sum of operating cost, capital cost, one quarter of tax opportunity cost, and the annualized bonus on expropriated private capacity.

3. *Private rent* in the observed case is residual: total revenue less the sum of operating cost, capital cost, provincial levies, and corporate income tax. In the hypothetical cases, private rent exists due to the assumption that the provincial government pays compensation for the 1.9 million-tonne capacity on stream in 1964 at a level 50 per cent above its cost.

Cases A and B provide measures of the rent that could have been captured by operating the Saskatchewan industry as a residual monopoly, *without* changing the actual sequence of investment decisions. Predictably, excess capacity exists in every year. In six years under Case A and four under Case B, optimum production is below 50 per cent of the installed level of "adjusted" capacity.

With the fob price ceiling set to the highest average annual, fob price per tonne actually realized (Cases A, C, D, and E), the constraint is operative in all years except 1964. With the fob price ceiling set to the mean of observed fob prices (Cases B and F), the constraint is operative in all years.

The forward value of observed rent, capitalized to 1977, was $849 million (all figures 1985$). Under Case B, where the fob price ceiling is the observed mean, $120/tonne, total rent, not surprisingly, is of similar magnitude: $811 million. Under Case A, where the fob price ceiling is the highest annual average – $161/tonne – total rent is $2,327 million. Capitalized federal rent falls due to the elimination of all corporate income tax payments. A bonus of 50 per cent above historical cost of nationalized assets permits realization of $650 million in capitalized private rent, approximately two thirds the observed level. Capitalized provincial rent rises from $612 million to $2,595 million under Case A and to $1,080 million under Case B.

Determination of capacity increments by successive application of the SDP algorithm further increases total capitalized rent: under Cases C, D, and E to a range of $3,577-$3,823 million; under Case F to $2,098 million. The reason is simple. Levels of installed capacity are lower here than those observed, reducing capital and tax opportunity costs. Indeed, in at least one year, 1974, optimum capacity exceeds installed capacity for all four cases of hypothetical investment scheduling.

In general, increasing the discount rate and the maximum fob price ceiling lowers the capacity on stream in any particular year. Why? A new mine implies that Sask Pot incur current costs for expected future benefits. The higher the discount rate the lower the present value of such benefits, and the larger, in undiscounted terms, must benefits be to warrant any increment. A higher fob price ceiling allows Sask Pot to exploit more vigorously its residual monopoly status, to raise market price by lowering production. With lower expected production in any year, the optimum capacity on stream in that year is also lower. The global maximum of hypothetical capitalized rent is achieved by Case E.

The significance of Case F is that even when Sask Pot's ability to exploit its residual monopoly status is severely restrained, total rent could hypothetically have been more than double that observed. Compared to Cases A and B, capitalized federal rent rises (is less negative) because the crown corporation, Sask Pot, withdraws fewer dollars from the financial market; capitalized private rent is unchanged; and capitalized total rent is close to the value of Case A.

Conclusion

Two conclusions are worth emphasizing from this case study. The first is that private entrepreneurs and politicians repeatedly form expectations about future trends in prices and quantities on the basis of group dynamic processes wherever uncertainty looms large enough to prevent an optimal strategy from being self-evident. This is essentially Simon's (1979) idea of "bounded rationality". In such contexts, specification of the optimal, income-maximizing decision is complex and costly, and agents economize by resorting to group-sanctioned conventions. These conventions range from the "gut feel" among farmers about next year's wheat prices to the choices economists make about what parameter values to include in computer models. Exercises in hypothetical rent maximization may convince public agents of the potentially large forgone benefits if they accept expectations generated by private agents and fail to invest resources in independent assessments. There is no guarantee that government planners do better than their private counterparts, but they have an obligation to try.

The second conclusion is the necessity of maintaining public ownership as the ultimate weapon in the government arsenal for rent collection. Without it, government has limited ability to bargain with an effective cartel of private producers. It is also better to be hung as a wolf than a sheep. Having incurred the political cost of the controversy over nationalization of private producers' assets, the Saskatchewan cabinet would have been able to pursue more consistently the benefit of rent collection had it taken over *all* private assets. It could then have avoided the dilemma into which it fell: simultaneously trying to restore its legitimacy among the remaining private Saskatchewan producers and acting as agent for Saskatchewan citizens in maximizing public rent capture. Pursuing both goals, the government achieved only qualified success toward either.

Notes

1. The inspiration for this convoluted means of illustrating the relative magnitude of potash rent is Chambers and Gordon's (1966) discussion of rent in the wheat boom during the first decade of the century. See the introductory chapter for a discussion of their model and results.

2. To understand this transport cost effect, begin with the idea that for Saskatchewan-supplied markets, transport costs dictate higher delivered prices the further from source. Being a bulky commodity, potash generates substantial transport costs in many markets. Consider now a non-Saskatchewan source, N, of limited reserves with higher unit production costs than in Saskatchewan. A dividing line will exist somewhere between Saskatchewan and the site of this second source, N, at which delivered cost (ignoring rent) is equal from both. Were no rent charged on production from source N, it would supply all markets on its side of the equal-delivered-cost line. But to do so would lead to its premature exhaustion. To maximize the present value of discounted net benefits from N, the *discounted* net benefit in any year of an incremental unit of N production (i.e. price less cost of production) should be equal. This implies the *undiscounted* fob-mine price of N should rise over time, the upper limit being the delivered cost of Saskatchewan potash at the site of N. Over time the equal-delivered-cost line, revised to include appropriate rent on N, will shift toward the site of N. The difference between source N unit production cost and optimal price will be the appropriate scarcity rent.

3. This historical discussion is sparsely footnoted. Readers desirous of a more extensive discussion, or of detailed references, are invited to turn to Richards & Pratt (1979).

4. Citations for judgments in the two cases are: *Central Canada Potash Ltd. et al.* v. *Government of Saskatchewan et al.*, QB, (1975) 5 WWR; SCA, (1977) 1 WWR; SCC, (1978) 6 WWR. *Canadian Industrial Gas & Oil Ltd. et al.* v. *Government of Saskatchewan et al.*, QB, (1975) 2 WWR; SCA, (1976) 2 WWR; SCC, (1977) 6 WWR.

5. This section provides a non-mathematical summary of an optimization exercise reported in Richards (1982).

6. Experience since 1970 suggests this assumption probably overestimates leakage from this source, and hence underestimates realizable rent. Despite strong demand during most intervening years that rendered prorationing provisions superfluous, U.S. production has declined. 1984 U.S. production was approximately one half the 2.5 million tonne leakage assumed in the model.

7. Since most nitrogenous fertilizer is derived from ammonia, for which natural gas is the major input, the post-1973 rise in hydrocarbon prices increased the cost and shifted upward the supply curve of nitrogenous fertilizer. However, prior to 1973, the last year of investment planning under the hypothetical exercise, oil and gas prices had not increased substantially. To have included gas prices as a variable would have imputed an unwarranted degree of foresight to Sask Pot planners.

8. This figure is derived from reported historical investment data, normalized by use of a price index, and officially rated capacity. Under prorationing, mine quotas were based on officially rated capacity, and producers tended to inflate the figure. Capacity figures have been reduced by approximately 25 per cent, and unit capital cost accordingly increased by the same factor. Once installed, capacity is assumed to be retained permanently. Capital cost accordingly includes a depreciation component. It is based on replacement of mines at thirty-year intervals.

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Chapter 5:

*Innovation in Public Rent Capture: The Saskatchewan Uranium Industry**

David L. Anderson

This chapter describes and evaluates the policies devised by the government of Saskatchewan between 1974 and 1982 to capture economic rent from its uranium mining industry. It focuses on the relationship between rent creation and rent appropriation. Without uranium development, no rents would be available for appropriation. Without effective rent capture, public support might not be sufficient to permit the government to develop this contentious mineral.

This study analyzes the NDP government's attempt to manage this complex trade-off. It begins with an overview of the uranium industry, followed by an evaluation of the mechanisms used by the government to collect uranium rents.

Overview and Historical Development of the Industry

The uranium mining industry produces a relatively homogeneous product, uranium oxide, more commonly known as yellowcake. It has two principal uses: feedstock in thermal nuclear reactors and fissile material for nuclear weapons. In fact, it was the rapid expansion of the nuclear weapons industry during World War II which led to the initial development of the Canadian uranium industry.

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* This paper is a revised and abridged version of a study, 'A Rent Appropriation Model: The Case of the Saskatchewan Uranium Industry', prepared under contract to the Institute for Research on Public Policy.

Canadian production increased steadily throughout the 1950s, reaching an all-time maximum of 15,900 short tons U_3O_8 (uranium oxide) in 1959 (Runnalls 1981, 3). By this time, Canada had become the world's largest exporter of uranium and its second largest producer. Although Ontario-based mines dominated Canadian output, Saskatchewan mines were also active. In 1958, for example, three Saskatchewan mills produced over 2,470 short tons U_3O_8 for a value of $59.8 million. This represented 18 per cent and 22 per cent of the corresponding Canadian totals for volume and value (Runnalls 1981, 3, 185; Denner and Reeves 1981, 1, 3).

The boom was, however, short lived. In November 1959 the United States and the United Kingdom terminated their lucrative uranium oxide purchase agreements. These actions were based on two factors: stocks had built up to satisfactory levels, and in the case of the United States, domestic production was deemed to be adequate for foreseeable requirements. The effect on the Canadian industry was devastating; it virtually collapsed. In Saskatchewan, only one mine remained in operation during 1963-1975. Without a heavily subsidized federal stockpile program, no Canedian producer would have survived the 1960s (Runnalls 1981, 6-7).

Despite the relatively soft markets of the mid-1960s, exploration activity continued – albeit at a modest level – due to a perception that nuclear power might eventually develop as an important source of electrical generation. This faith ultimately led to three major finds in Saskatchewan. In 1968 Gulf Minerals announced the discovery at Rabbit Lake of a 40,000 short ton U_3O_8 deposit contained in ore averaging 0.4 per cent U_3O_8. Also during this year, Mokta, a French-owned venture, found a rich but small deposit at Cluff Lake. The 'D' zone (as it was called) contained 7,000 short tons U_3O_8 from ore averaging 7 per cent U_3O_8. The company also found a number of lower grade deposits averaging 0.3 per cent to 0.6 per cent U_3O_8 which were expected to yield in the order of a 16,500 short tons U_3O_8.

The Cluff Lake property took longer to develop than Rabbit Lake. However, as the price of yellowcake climbed in the mid-1970s, the operating company, now known as Amok Ltd., initiated development plans. The company informed the provincial government that it would not proceed until the province had formalized its uranium development/tax strategy.

A third major discovery was made at Key Lake. Although the full extent of this find was not determined until after elaboration of uranium development and taxation policy, it served to reinforce the importance of devising suitable policy. There was little doubt that the Athabaska sandstone formation was potentially one of the world's leading sources of uranium.

The 1973 OPEC oil price increases did not induce the expected boom in nuclear thermal power generation for a host of reasons including economic recession, price-induced reductions in energy consumption, and the political aftermath of the Three Mile Island incident. The continued downward adjustment of uranium demand expectations can be inferred from the data presented in Table 1. In 1975 the Australian Atomic Energy Agency expected that by 1985 world-wide, installed thermal nuclear capacity would be 500 GWe (gigawatt equivalent); five years later this estimate had dropped by more than 50 per cent, to 243 GWe. Similarly, for the United States alone, the U.S. Department of Energy in 1969 projected 1980 thermal nuclear power capacity to be 149 GWe; the actual was only 51 GWe (Silver 1982, 17). The process of downward adjustment continues. Between 1977 and 1983, the Organization for Economic Cooperation and Development (OECD) and the

Table 1
Change in Australian Atomic Energy Estimates of World Nuclear Power Growth

	Installed Capacity Gigawatt equivalent (GWe)			
Year of Estimate	1980	1985	1990	2000
1975	213	500	898	2,150
1976	193	488	900	2,130
1977	158	355	635	1,465
1978	149	272	468	950
1979	141	251	395	728
1980	123	243	355	585

Source: Silver 1982, 17.

International Atomic Energy Agency (IAEA) upper estimate of installed capacity for the year 2000 in the so-called WOCA (World Outside the Centrally Planned Economies Area) declined from 1,207 GWe to 558 GWe (OECD 1984). The Canadian nuclear industry has experienced an even more devastating decline. In 1974 the federal Department of Energy, Mines, and Resources predicted that installed capacity in Canada in 1995 would be 100 GWe; revised predictions are now in the order of 15 to 20 GWe (Merlin 1983, 5; Canada 1983).

Notwithstanding these projections, an IAEA/OECD report issued in 1984 indicates that uranium consumption should increase from 52,000 short tons U_3O_8 to approximately 78,000 short tons U_3O_8 over the period 1984-1995 (OECD 1984). However, these data overstate the size of the market available to new entrants. Current inventories represent four-five years of annual consumption at present rates. Existing long term contracts cover much of the anticipated increase, and the U.S. market is somewhat precarious due to intermittent reliance on restrictive non-tariff trade barriers (Geddes 1984; Gray 1982; Radetzk 1982).

As might be expected in such a turbulent market, the spot price of yellowcake has fluctuated substantially. As shown in Table 2, the Nuexco spot price was below US $6.00/lb. in 1972. By 1977 it had climbed to US $43.50. Note that in real terms the 1984 spot price is close to the depression levels of 1968-1974.

Evolution of Saskatchewan Uranium Policy

Introduction

In 1973 the NDP government of Saskatchewan embarked upon a rent-capturing exercise in the oil and potash sectors. By late 1974 interest in rent collection extended to uranium. Pragmatic factors were at play. Amok Ltd. wanted to develop its Cluff Lake property, but would not do so until the rules of the game had been delineated. Uranium oxide prices were rising, and the Athabaska sandstone formation was expected to yield additional rich deposits.

The government decided to adopt novel rent-capturing devices for uranium quite different from those for oil and potash. Two major factors were behind this decision: reliance on conventional taxes was seen as risky due to constitutional litigation (Anderson 1981), and whereas the oil and potash sectors were relatively mature, the uranium industry was largely undeveloped.

The two vehicles chosen for rent collection were a rate-of-return tax system and a two-part public ownership scheme.

Table 2
Nuexco Spot Price For Uranium Oxide (per pound)

Year	Current Year US $[1]	Current Year Canadian $[2]	Constant 1981 Canadian $[3]
1969	6.40	6.89	18.27
1972	5.95	5.89	13.74
1973	6.50	6.50	13.91
1974	11.50	11.25	20.80
1975	24.70	25.12	41.95
1976	41.00	40.42	61.82
1977	43.50	46.23	66.00
1978	43.50	49.63	66.72
1979	43.00	50.35	61.24
1980	31.50	36.82	39.63
1981	24.25	29.10	29.10
1982	20.50	25.20	22.68
1983	24.00	29.52	24.60
1984	18.50	24.67	19.58

[1] Obtained from *Engineering and Mining Journal*, various issues; mid year prices.

[2] Exchange rate source: Canada, Department of Finance 1984.

[3] Mid-1981 prices based on the gross national expenditure implicit price index.

These tools which are, in part, alternative mechanisms for capturing rent also are complementary. Government willingness to exercise public ownership, especially if the government has the political support and managerial expertise to "pull it off", increases the private producer's risk from the adoption of a tax defiance posture. On the other hand a tax system which appropriates a high proportion of rents will frequently lead to adverse corporate reaction. This in turn increases the public acceptance of direct government involvement.

The Saskatchewan Uranium Royalty

The provincial tax planners, when setting out in early 1975 to design a new structure for the uranium industry, sought a scheme that would:

(i) ensure that a fair share of the excess profits from uranium minerals is captured by the province as owner of the resource;

(ii) provide the producers with an adequate rate of return on investment, bearing in mind that mineral exploration is a relatively risky proposition and that market fluctuations have been substantial;

(iii) leave marginal production decisions as unaffected as possible;

(iv) guarantee a minimum payment to the province in return for its resources so that resources are not given away just to maintain production, except where the provinces may determine it is in the social interest to do so (Halkett 1977).

In effect the policy-makers were pursuing the underlying political objectives outlined earlier, and to some extent, the objectives were in conflict. Growth and diversification of the economy, and outflanking of the potash producers, implied pursuit of rapid uranium development. Simultaneous pursuit of rent collection could retard development. This trade-off prompted the designers to opt for a scheme that did not aggressively appropriate rents until potential investors earned a return somewhat in excess of their risk-adjusted cost of capital. In the following section the Saskatchewan Uranium Royalty (SUR) will be evaluated to determine if its design characteristics are generally consistent with the above political economy arguments.

The Saskatchewan Metallic Royalty (SMR), which preceded the SUR, was enacted in 1964 (Anderson 1984). It was characterized by a three-year, tax-free holiday on net income earned after the commencement of commercial operations. Thereafter the mine was subject to a marginal rate structure of 5, 7, and 9 per cent, with the upper rate applying to net income in excess of $500,000. Depreciation of allowable capital was deductible on a 15 per cent straight-line basis. In addition, SMR provided for a processing allowance which was equal to 8 per cent per year of the original cost of the processing assets, but was not to be less than 15 per cent, nor more than 65 per cent of net income less depreciation (Mackenzie and Bilodeau 1979). This scheme did not yield the crown a significant proportion of a project's potential economic rent.

The Saskatchewan Uranium Royalty (SUR) took affect on August 1, 1976. The new scheme has two major parts: a basic royalty (BR) and a graduated royalty (GR). The first component is an ad valorem levy of 3 per cent of gross sales. Although blatantly inconsistent with the neutrality concept promulgated by advocates of rate-of-return taxation, it assists the government in two interrelated ways. It provides a limited, but relatively certain, revenue; and it serves the useful political role of allowing the government to claim that under all price conditions, it garners at least some revenue.

The graduated royalty component of the tax is of interest from both a theoretical and empirical perspective. Briefly, it is calculated in the following manner (Halkett 1977). For each prospective mine, an allowable capital investment figure, known as the Capital Investment Base (CIB), is determined. This figure is the forward value[1] of pre-production expenditures to the date at which the mine is deemed to have entered commercial production. At this point, the Capital Investment Base becomes fixed in value; it now serves as the denominator of the rate-of-return calculation. In addition, this value is the opening balance of another important variable in the SUR calculation: the Capital Recovery Bank (CRB).

Each year the CRB is reduced by the Capital Recovery Allowance (CRA) equal to the relevant period's unadjusted operating profit (OP) or the current CRB – whichever is less. The CRB cannot fall below zero. If the year-end balance of the CRB is greater than zero, then the amount remaining is "grossed-up" by the interest factor (IF) in a fashion analogous to that described in the forward value derivation of CIB.

One more parameter remains to be calculated. The operating profit (OP) is equal to the mine's gross sales (GS), less the sum of the following items: production cost (PC); basic royalty (BR); arbitrary expenditure allowances for administration (AEA), marketing (MEA), and working capital (WCA) outlays; and operating loss carryforwards (not subject to the gross-up provisions). Note that production cost (PC) excludes depreciation and financial charges, and royalty payments, but includes maintenance capital outlays and a provision for the depreciation of social capital.

When the Capital Recovery Bank (CRB) has been reduced to zero, all interest-adjusted capital outlays have been recovered by the investor (i.e. he has earned a normal return on his investment), and the graduated royalty scheme is enacted. Determination of the required payment first involves the derivation of the ratio of operating profits (OP) to the capital investment base (CIB); the result, when expressed in percentage terms, is noted as the rate of return on investment (ROI). The second stage of the calculation requires the taxpayer to work through the following marginal rate structure (Gungh and Pilling 1980):

If ROI rate is (in per cent)	then the graduated royalty payable is:
- less than 15	- nil
- 15 to 25	- amount A equal to 15 per cent of operating profit in excess of 15 per cent ROI
- 25 to 45	- amount B equal to A plus 30 per cent of operating profit in excess of 25 per cent ROI
- greater than 45	- amount C equal to B plus 50 per cent of operating profit in excess of 45 per cent ROI

Note that even after full capital cost recovery, the investor is able to earn a tax-free rate of return (ignoring inflation) of 15 per cent before the graduated royalty (GR) takes effect. Note also that the maximum marginal rate of 50 per cent only applies to profits associated with a ROI in excess of 45 per cent.

The total Saskatchewan Uranium Royalty (SUR) payment is determined by the sum of the basic (BR) and the graduated royalty (GR) less, if applicable, a royalty credit of 35 per cent of the value of qualified exploration expenses for which no prior claim has been made for Saskatchewan Uranium Royalty purposes.

With the exception of certain types of exploration expenditures, the SUR is project specific. An accounting fence is drawn around each mine site regardless of the actual ownership structure of the venture. Furthermore, each project is assumed to be 100 per cent equity-financed since interest and financial changes are not deductible against revenue in the determination of operating profit. In addition, the SUR exhibits a rather generous treatment of depreciation expense. In fact, the investor is allowed a double write off of the original capital. (Kwon 1982).

Why a double write-off? When the capital recovery bank (CRB) has been reduced to zero, the mine has generated a return equal to the cost of capital invested, assuming the interest factor (IF) is the appropriate rate of return. Any further operating profit is rent and should, in theory, be subject to the graduated royalty. To allow a 15 per cent return to the CIB each year, royalty free, is to permit a double write-off.

It is important to note that the SUR is specified in current prices. The rate of inflation has an impact on the real value of the payments. Such an outcome arises because the CIB is denominated in the price level of the year in which the mine entered commercial production, whereas the numerator of the rate-of-return calculation is specified in current-year prices. All else held constant, the reported ROI for any positive rate of inflation will rise continuously over time. The higher the rate of inflation, therefore, the higher is the graduated royalty payable over time.

Public Enterprise and Public/Private Joint Ventures

It is probably fair to conclude that, prior to the post-1973 resource revenue conflicts, the provincial NDP government believed the proper vehicle for appropriating rent to be simply the tax system. Nevertheless, some of their policy advisors were troubled by the "transfer pricing" issue which could lead to an increase in private sector profits at the expense of the public purse and which is an argument in favour of using crown corporations as a "window" on the industry.

However, not until commencement of the potash conflict in mid-1974 were serious doubts raised about the efficacy of the tax system as a rent-capturing device (Anderson 1981; Richards and Pratt 1979). A combination of litigation, federal/provincial disputes, and an aggressive anti-NDP media campaign convinced the government by mid-1975 that the security of tax revenue from potash was threatened. For example, on March 18, 1976, Premier Blakeney said:

> The industry also was withholding essential financial information, withholding about $30 million in taxes, refusing to obey some of our laws and launching court cases aimed at undermining almost every tax we had levied . . . Under these circumstances, Saskatchewan felt its only resource was to take effective control through ownership of some or all of the mines – at least 50 per cent of the productive capacity. (Saskatchewan Executive Council 1976, 2).

The government concluded that the risks of rent capture through public ownership were less than those of continued taxation. The province's uranium mining policy was being designed simultaneously and undoubtedly was influenced by this line of thought.

A second and related dispute was also taking place in the mid-1970s: the battle between the federal and provincial governments over effective control of non-renewable resources and associated rents. Section 125 of the *Constitution Act* (*British North American Act* renamed) holds special significance. Under the traditional interpretation of this section, a crown corporation owned by one level of government does not pay income tax to the other. By taking advantage of this convention, the province could employ a crown corporation to transfer rents from the federal to the provincial government.

On the other hand, the NDP's desire to encourage an immediate expansion of uranium mining operated against total reliance on a strategy of crown ownership. Not only would it have placed intolerable financial demands on the provincial government's borrowing capacity, it would have exceeded the government's managerial and technical expertise. Instead, the government pursued public/private joint ventures which, it was hoped, would reduce the political opposition to public enterprise while continuing to yield many of its purported benefits. The government hoped that joint ventures would stimulate exploration and development activity, provide a "window" on the industry, facilitate transfer of some rent from the federal to the provincial government, and possibly lead to the capture of additional rents in the form of a return on state equity. The government adopted a two-part strategy: formation of a crown corporation, the Saskatchewan Mining Development Corporation (SMDC), and a scheme mandating public/private joint ventures, the Crown Equity Participation Program (CEP). Each will be explored in turn.

In June 1974, SMDC was set up through an order-in-council. It received a more formal legislative status in 1977 with passage of the *Saskatchewan Mining Development Corporation Act*. According to a senior SMDC official, the corporation was expected to pursue the following objectives:

> (1) To obtain public participation in all phases of the mineral industry from grass roots exploration, through to development of a mine and finally marketing of product; and
> (2) To provide a sound investment that would realize a good rate of return to the people of the province in the mid- to late-1980s when a drop in revenues from oil might occur (Francis 1979).

It should be noted that although SMDC was given a mandate to explore and develop all mineral properties except those containing sodium sulphate and potash, its initial responsibility was to encourage joint public/private exploration for uranium in northern Saskatchewan.

The second component, the CEP, was enacted in 1975 through an amendment to the 1961 Mineral Disposition Regulation. Under this scheme, any private firm which expected to spend in any year more than $10,000 on Saskatchewan mineral exploration was required to offer the province's designated agent the right to acquire up to a 50 per cent beneficial interest in the project. After being informed of the proposal, the province's agent, SMDC, had 60 days in which to exercise its option. Once a decision was made, the government agreed to live with the outcome; thereafter it could increase its shareholdings only though a voluntary agreement with the private participants (Francis 1979, 4-5).

A unique feature of the program was its elimination of retroactivity. The province was to express its interest *prior* to the expenditure of funds and to share in all subsequent exploration and development costs in proportion to its interest in the property. The government was presumably sensitive to the criticism that in the case of the potash industry it drafted low, fixed, ad valorem royalties until technical problems were solved and major investment committed and then rewrote the rules to increase public revenue.

Evaluation of the Rent Appropriation Scheme

The Saskatchewan Uranium Royalty

Putting the SUR in a real-world context – a proxy version of the Key Lake Mine – is illuminating.

A conventional, discounted cash flow model will be used to calculate the net present value of the cash flows appropriated by each of the claimants to the project's economic rent. First, a few comments are required on the overall tax model and the explicit parameter values associated with the "base case" data set.

SUR is one of three main taxes on uranium mining activities in Saskatchewan. The others are federal and provincial corporate income taxes. In aggregate, the three schemes generate a maximum tax rate on incremental revenues of 85.3 per cent[2]. When this rate applies, incremental revenue is divided in a ratio of 15:27:7:52 between equity holders, federal corporate income tax, provincial corporate income tax, and Saskatchewan Uranium Royalty, respectively.

Published data on the Key Lake Mine are somewhat incomplete;[3] therefore it will be labelled "Proxy" Key Lake Mine (PKL). Nevertheless, PKL probably provides reasonable estimates of the potential capacity of the Key Lake ore body to generate economic rent.

Basic assumptions are as follows. The mine will be developed over four years at a cost of $508 million (1981$), and it will produce 6,000 short tons per year U_3O_8 over 15 years. Operating costs are $4.50/lb U_3O_8; annual capital maintenance outlays are 2 per cent of the initial construction costs. In addition, the mill is designed to produce the 6,000 short tons U_3O_8 per annum from two adjacent ore bodies which contain 94,000 short tons U_3O_8 at an average ore grade of 2.63 per cent.

The "base case" data set uses a number of parameter estimates. For example, the underlying rate of inflation is set at 0 per cent and the interest factor (real risk-adjusted interest rate) at 6 per cent per annum.[4] All cash flows are presented in mid-1981 constant dollars and are subject to a real discount rate of 10 per cent. Initially, uranium oxide is assumed to sell for US $30/lb U_3O_8.[5] In addition, the project is assumed to be 100 per cent equity financed, and the analysis is undertaken from a project-specific rather than an integrated-company perspective. This means that all tax write-offs must be expensed against project revenue rather than taxable income from other company activities. It also precludes the use of such instruments as "flow-through shares".

The results of the base run can be found in Tables 3 and 4. At the base price of US $30/lb, the project yields a net present value of almost $1,100 million. This rent is allocated among the three claimants (equity holders, federal and provincial governments) in a ratio of 43:19:38.[6] In absolute terms, the provincial government acquires $409 million, with the SUR generating 80 per cent of this amount.

Although the above information suggests that the Key Lake ore body should yield significant economic rents, its full potential can only be revealed by tracing the impact of a wide range of plausible selling prices (ASPs) on the project's economic performance. In carrying out this task, ASP was given values throughout the feasible range: from US $15 to US $60/lb U_3O_8. The lower price is an estimate of the minimum, long-term supply price of U_3O_8; the upper price is the April 1976 Nuexco spot price (expressed in terms of mid-1981 dollars). The results of the sensitivity analysis also are shown in Tables 3 and 4. At a sale price of US $20, for example, the equity holders appropriate 54 per cent of the rent ($271 million); whereas at a price of US $60,

Table 3
Proxy Key Lake Mine
Distribution of Economic Rent Among Claimants Over Lifetime of Mine, by Uranium Price[1]
(millions of 1981 Canadian dollars)

	Claimants	Average Selling Price (US$/lb U_3O_8)							
		15	20	25	30	35	40	50	60
1.	Equity Holders	110.8	270.5	390.5	470.8	533.1	605.4	711.1	805.4
2.	Canada Corporate Income Tax	36.6	86.0	142.6	209.3	280.3	353.6	504.2	658.1
3.	Province of Saskatchewan Corporate Income Tax	17.2	37.4	59.4	81.7	102.0	121.0	162.3	201.5
4.	Uranium Royalty	42.0	106.8	202.3	327.1	467.6	597.1	887.7	1188.4
5.	TAX: TOTAL (2+3+4)	95.8	230.2	404.3	618.1	849.9	1,071.7	1,554.2	2,048.0
6.	NPV: TOTAL (1+5)	206.6	500.7	794.8	1,088.9	1,383.0	1,677.1	2,265.3	2,853.4
	After Tax Internal Rate of Return (per cent)	13.6	18.4	21.9	24.4	26.4	28.5	31.3	33.6

[1] Real discount rate of 10 per cent is used in calculating present values. Additional assumptions can be found in the "base case" data set as outlined in the text.

Table 4
Proxy Key Lake Mine
Percentage Distribution of Total (and Incremental) Economic Rent, By Uranium Price[1]
(percentages)

Claimants	Average Selling Price (US$/lb U_3O_8)							
	15	20	25	30	35	40	50	60
Equity Holders	53.6 (n/a)	54.0 (54.3)	49.1 (40.1)	43.2 (27.3)	38.5 (21.2)	36.1 (24.6)	31.4 (16.3)	28.2 (16.0)
Canada Corporate Income Tax	17.7 (n/a)	17.2 (16.8)	17.9 (19.2)	19.2 (22.7)	20.3 (24.1)	21.1 (24.9)	22.3 (25.7)	23.1 (26.1)
Province of Saskatchewan								
Corporate Income Tax	8.3 (n/a)	7.5 (6.9)	7.5 (7.5)	7.5 (7.5)	7.4 (6.9)	7.2 (6.5)	7.2 (7.0)	7.1 (6.7)
Uranium Royalty	20.3 (n/a)	21.3 (22.0)	25.5 (32.5)	30.0 (42.4)	33.8 (47.8)	35.6 (44.0)	39.2 (49.4)	41.6 (51.1)
NPV: Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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[1] The upper figure in each cell represents each claimant's percentage share of the total economic rent generated at a given selling price. The lower figure in each cell (in parentheses) represents each claimant's share of incremental economic rent generated by the selling price increasing to that pertaining to the column from that applicable to the preceding column.

that figure declines to 28 per cent. In comparison, SUR appropriates 21 per cent and 42 per cent, respectively, of the surplus at these prices and generates a marginal tax rate of 22 per cent and 51 per cent. The corresponding, total marginal rates are 46 per cent and 84 per cent.

The aggregate marginal tax structure is steeply progressive. From a 46 per cent rate at an average selling price of US $20, it increases rapidly to 60 per cent and 79 per cent at prices of US $25 and US $35, respectively. Corresponding figures for the SUR marginal rates are 22 per cent, 33 per cent, and 48 per cent. The progressive nature of the system can be attributed to the provincial royalty levy. Within the current, feasible price range of US $25 to US $35, the government acquires 60 per cent to 80 per cent of incremental sales revenue, with the SUR alone generating revenues of $202 and $468 million at the lower and upper price levels, respectively. Nevertheless, the firm's shareholders retain rents of $391 and $533 million and earn at the end points of the feasible price range a real internal rate of return of 22 per cent and 26 per cent.

While the SUR can be expected to appropriate 20 per cent to 40 per cent of all available rents, the full impact of this tax levy cannot be observed until its revenue estimates are compared to those under the prior levy – the Saskatchewan Metallic Royalty (SMR).

The data suggest that SUR radically alters the after-tax distribution of a project's surplus in favour of the provincial government, at the expense of the equity holders. The federal government's revenues are unaffected by imposition of the SUR. The magnitude of the private-to-public transfer is startling. For example, if the average annual rate of inflation is 10 per cent, then the expected transfer of rent is $341, $540, and $990 million at selling prices of US $30, $40, and $60 (Table 5).

The data in Tables 3 and 5 also can be used to indicate the sensitivity of the SUR and other taxes to various rates of inflation. For example, if the rate of inflation increases from 0 per cent to 10 per cent per annum, the SUR captures an additional $101 million at a price of US $30. The effect on equity is even more dramatic. Their net present value declines by approximately 50 per cent, from $471 to $233 million. Note that inflation's effect on the SUR decreases as the expected selling price increases. This unusual result is attributable to the fact that, at prices of US $50-$60, the project is likely to be taxed at the maximum marginal rate, independent of the rate of inflation. In contrast, at prices of US $15-$30, above zero inflation rates result in spuriously high rate-of-return estimates which, in turn,

Table 5
Proxy Key Lake Mine
Distribution of Economic Rent Among The Claimants, By Tax Scenarios and Uranium Price, Discount Rate of 10 Per cent, Inflation Rate of 10 Per cent[1]
(millions of mid-1981 Canadian dollars)

Claimants	Average Selling Price (US$/lb U_3O_8)							
	20		30		40		60	
	SUR[2]	SMR[3]	SUR	SMR	SUR	SMR	SUR	SMR
1. Equity Holders	105.4	245.5	233.4	574.1	352.8	892.5	523.5	1,513.9
2. Canada Corporate Income Tax	121.1	121.1	248.2	248.2	383.1	383.1	663.8	663.8
3. Province of Sask. Corporate Income Tax	43.0	49.1	78.5	99.7	114.7	152.1	187.0	261.7
4. Royalty	184.4	38.3	428.4	66.5	672.6	95.5	1,218.3	153.2
5. TAX: TOTAL (2.+3.+4.)	348.5	208.5	755.1	414.4	1,170.4	630.7	2,069.1	1,078.7
6. NPV: TOTAL (1.+5.)	453.9	453.9	988.5	988.5	1,523.2	1,523.2	2,592.6	2,592.6
After Tax Internal Rate of Return (per cent)	14.5	18.4	19.7	27.0	24.1	33.7	26.6	39.2

[1] Note that the calculations in this table are based on a 10 per cent inflation rate. In all other tables, the "base case" assumption of 0 per cent applies.

[2] Saskatchewan Uranium Royalty (SUR).

[3] Saskatchewan Metallic Royalty (SMR).

shift the project into higher tax brackets. For further discussion of this important topic see Barnett and Anderson (1983).

Additional sensitivity analysis suggests that the results obtained are reasonably stable with respect to alternative operating cost, prime rate, and discount rate estimates. From a public policy perspective, perhaps the most interesting results were found when testing the sensitivity of the distribution of economic rent to alternative levels of capital investment. For instance, if construction costs exceed the base case estimates by 20 per cent, the present value estimate of the equity holders net cash-flow actually increases by $12.6 million – despite a decline in the project's NPV of $81.6 million. The mere expenditure of additional capital, with no change in sales revenue or operating cost, may result in an increase in the investor's after-tax rate of return. However, it is important to stress that this applies to capital spent pre-production, not on capital for maintenance or minor output expansions.

In general, it must be concluded that the uranium policy met its objectives. The industry clearly boomed from 1976 to 1981, and as shown, a significant rent transfer occurred from the equity holders to the provincial government.

The SUR was unusual in its being acceptable to both the mining industry and a NDP government. The business community obtained a tax that was extremely sensitive to industry profitability and one that provided strong incentives to carry out additional exploration and investment activity. The government, in return, obtained the political mileage that flows from a tax system that allowed it successfully to address the concerns of a number of constituents. It appeased many of its supporters since the SUR appropriated, in conjunction with the other levies, up to 85 cents on every incremental sales dollar, and approximately three quarters of available economic rent under certain plausible scenarios. Also, the NDP was able to refute corporate critics of its non-renewable resource policies by demonstrating that private firms would explore and invest – and at record levels – with full knowledge that much of any ensuing rent would be captured by the crown. And finally, the rather generous incentives provided new private investment mollified corporate mistrust of the compulsory joint venture policy.

Nevertheless, the scheme is not without its problems, especially if viewed from a relatively narrow, economic efficiency or "neutrality" perspective. The use of an ad valorem, base royalty indicates that the scheme does violate neutrality assumptions. Such taxes are well known to lead to non-optimal depletion rates. In addition, under certain scenarios, the net investor cost of incremental expansion can be negative. This suggests that SUR may lead to the construction of mines which display an excessive capital/labour ratio.

Public Sector Equity Participation

One of Saskatchewan's most profitable projects involving direct government participation in uranium mining predates creation of SMDC. In early 1974 the Bell Oil Co. approached the Saskatchewan government and offered to sell its one-third share of the Key Lake exploration project. After agreeing to purchase the interest for $400,000, the government set up SMDC to administer the acquisition. As outlined previously, the government had intended to set up such an agency and the Key Lake purchase accelerated its timetable. However, SMDC did not assume its mandate role until after the announcement in 1975 of the Crown Equity Participation Program (CEP).

SMDC initially concentrated its efforts on the exploration phase of the mineral cycle. As can be seen from Table 6, its absolute level of expenditure on such activities increased significantly during 1974-1979: from $2.6 million to $33 million. The number of operational exploration projects in which SMDC possessed an interest increased from 6 to 273. In 1979, 233 of these projects were attributable to CEP. Interestingly, many of these agreements were willingly entered into by major international oil and mining companies.

Several of the CEP properties yielded promising results. For example, Denner and Reeves (1981) in their assessment of potential mine developments list seven prospective properties in northern Saskatchewan. Of these, SMDC held at least 50 per cent ownership in three ventures and a 33 per cent interest in a fourth. After the NDP government's defeat in 1982, a major new discovery was made at Cigar Lake by a joint venture in which SMDC holds a 50.75 per cent interest. This property is said to contain the largest high-grade uranium deposit in the world (SMDC 1984).

In 1979 the crown corporation began to shift its interest to the development stage of the mineral cycle. SMDC has been involved in two such ventures to date. It acquired its original one-third interest in the Key Lake project in 1974 for $400,000. The following year a major discovery was made, followed in 1976 by the announcement of the existence of an adjacent ore body. Subsequent delineation revealed the property to contain 94,300 short tons U_3O_8, found in ore averaging 2.63 per cent U_3O_8. The financial viability of the project was enhanced because the ore is close to the surface, facilitating relatively shallow open-pit

Table 6
SMDC and Saskatchewan Exploration Expenditures, 1974-1981 (current year dollars)

Year	SMDC[1,5] (millions of $)	Total Saskatchewan[2,5] (millions of $)	SMDC as per cent of Saskatchewan Total	Saskatchewan as per cent of Canadian Total[3]
1974	1.0	3.5	28.6	n.a.
1975	2.6	5.5	47.3	n.a.
1976	10.1	20.0	50.5	30.6
1977	20.2	40.0	50.5	49.2
1979	33.1	80.1	41.4	54.4
1980	29.8	100.0	29.8	60.3
1981	29.4	70.0	42.0	59.5
1982	23.9	45.0	53.1	n.a.
1983[4]	12.0	35.0	34.3	n.a.

[1] Unpublished estimates provided by Saskatchewan Mining Development Corporation

[2] Unpublished estimates provided by Saskatchewan Department of Energy and Mines.

[3] Based on data published by Canada, Energy, Mines and Resources, annual.

[4] 1983 figures are estimates only.

[5] The SMDC and "Total Saskatchewan" figures presented herein relate more precisely to all mineral exploration expenditures in northern Saskatchewan. However, industry and government officials suggest that 1974-1981, at least 90 per cent of all such expenditures were directed toward the discovery of uranium. During 1982 and 1983, the corresponding figures probably were 80 per cent and 70 per cent, respectively.

extraction. The Key Lake deposit is one of the largest and richest uranium finds in the world.

The first indication of the real worth of this venture occurred in 1978 when Denison Mines offered approximately $180 million for Inexco's one-third interest in the property (Twigg 1978, 19). SMDC subsequently exercised its right of first refusal and acquired the interest by matching Denison's offer. One-half of the acquisition was then sold at cost to Eldorado Nuclear, a federal crown corporation. This left SMDC with a 50 per cent share of the project, with Uranerz and Eldorado Nuclear holding 33 per cent and 17 per cent, respectively.

The Key Lake project ultimately received development approval in August 1981, and the $500 million operation (6,000 short tons/year U_3O_8) entered commercial production in late 1983. Based on the data in Table 7, the Key Lake mine should yield SMDC a positive net present value if its average selling price exceeds US$17. For example, if average price is US$30, SMDC should obtain a net present value return of $228 million: $123 million as a return on equity and $105 million as a transfer from the federal government to the crown corporation, due to Section 125 of the Constitution Act.

Table 7 prompts some observations on the wisdom of SMDC's 1978 purchase of an additional one-sixth interest in KLM for $122.6 million (1981$).[7] In order for this transaction to yield a positive net present value, the expected selling price must exceed US $29. This suggests that under the assumptions used in this analysis, SMDC's 1978 acquisition of an additional one-sixth interest was a marginal proposition. Nevertheless, the incremental purchase gave SMDC effective control of the project at a zero net cost (in percent value terms) to the Saskatchewan taxpayer provided price exceeds US $29. Furthermore, at the time of its purchase from Inexco and the Amok acquisition discussed below, yellowcake prices were between US $50 and $60/lb U_3O_8 (1981$).

SMDC also is involved in the Cluff Lake project. In 1978, during construction of the $80 million mine and mill (2,000 short ton/year U_3O_8), the crown corporation purchased a 20 per cent interest in the project. The Cluff Lake development was to cover two distinct phases. The first, as outlined above, involved the mining of the 'D' deposit, expected to yield 7,000 short tons U_3O_8 contained in ore averaging an incredibly rich 7 per cent U_3O_8. The second, which entered commercial production in 1984, required the expenditure of $114 million to develop three small ore bodies expected to yield 16,500 short tons U_3O_8 at an average

Table 7
Proxy Key Lake Mine
Rent Appropriation by SMDC Under Alternative Investment Scenarios[1]
(millions of 1981 Canadian dollars)

	Average Selling Price (US$/lb U_3O_8)							
	15	20	25	30	35	40	50	60
SMDC: 33 per cent Ownership								
- Return to Equity	36.6	89.3	128.9	155.4	175.9	199.8	234.7	265.8
- Transfer of Federal Corporate Income Tax to SMDC	12.1	28.4	47.1	69.1	92.5	116.7	166.4	217.2
Total Economic Rent to SMDC	48.7	117.7	176.0	224.5	268.4	316.5	401.1	483.0
SMDC: 50 per cent Ownership								
- Return to Equity	-57.2	22.7	82.6	122.8	154.0	190.1	242.9	290.1
- Transfer of Federal Corporate Income Tax to SMDC	18.3	43.0	71.3	104.7	140.1	176.8	252.1	329.0
Total Economic Rent to SMDC	-38.9	65.7	153.9	227.5	294.1	366.9	495.0	619.0
Incremental Economic Rent Appropriated Through Increase in Ownership position	-87.6	-52.0	-22.1	+3.0	+25.7	+50.4	+93.9	+136.1

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[1] Real discount rate of 10 per cent used in calculating present values. Inflation assumed to be 0 per cent. Under 33 per cent ownership option, one third of "equity holders" and "Canada: corporate income tax" attributed to "return to equity" and "transfer of federal corporate income tax to SMDC", respectively. Under the 50 per cent ownership option, adjustment process as above except one half replaces one third as the applicable adjustment factor. Furthermore, the purchase price of the incremental 17 per cent equity, $112.6 million, has been deducted from SMDC's gross return to equity estimate, to present a net increase in the net present value of SMDC's beneficial interest in the Proxy Key Lake property.

ore grade of between 0.4 per cent and 0.6 per cent U_3O_8 (Cluff Mining 1982).

Some observers have suggested that the purchase price of $63 million (1979$) for a 20 per cent interest in the Cluff Lake property may not yield SMDC a positive net present value. Given the dramatic decline in prevailing estimates of future prices from the time of purchase (1979) until now (1986), such an outcome would not be surprising. Nevertheless, there is no proof that this will be the case.

There is at least one important political reason for the payment of a premium for this 20 per cent interest. The price of yellowcake started its decline in the late 1970s; and as the anti-uranium lobby increased the intensity of its attacks, including a challenge to the financial viability of SMDC, the government sought to realize current accounting profits for SMDC. It was not enough to promise the voter (quite correctly) that by the mid-1980s, SMDC would be reporting significant profits. The public had become sceptical of politicians promising future riches. Purchase of an interest in the Cluff Lake property presented a ready solution to the problem. The mine's relatively low operating cost, and sales contracts at high selling prices for phase I product, virtually guaranteed SMDC an accounting profit from 1981 until the Key Lake mine came into operation in 1984. In fact, SMDC reported net earnings of $5.6, $5.5, and $2.1 million in 1981, 1982, and 1983, respectively.

Over its lifetime, the Key Lake mine should generate substantial rents to SMDC. This may be offset by a small loss on its Cluff Lake investment. Furthermore, as discussed previously in this chapter, SMDC holds large, commercially viable reserves.

Aside from the direct rent-appropriation role noted above, SMDC and the CEP program were created for additional reasons, some of which are of interest here. It must have been apparent to any potential investor that Saskatchewan provided a relatively safe investment climate. Nowhere else in Canada – with the possible exception of Ontario – had a provincial government explicitly committed itself to uranium mining. In other words, it was highly unlikely that the NDP government would bow to pressure to curtail uranium mining when it had several hundred million dollars invested in the operation. And, if small appeasements were made to critics, their impact was likely to be on projects without government participation. This perception was vindicated by the government's 1979 statement that Key Lake (50 per cent SMDC ownership) probably would receive development priority over Mid-West Lake (0 per cent SMDC interest); and it undoubtedly reduced the level of objection to the SMDC/CEP package.

The realization of joint ventures through SMDC aided the government in its public relations battle with the potash industry. Given both the number of joint ventures and the nature of the participants, it was difficult for the potash lobby to claim that the government's resource policy was anti-business and anti-development.

Although the CEP program aided SMDC in its early years, by 1980 it had become a minor, but nonetheless real, retarding force. SMDC had acquired a vast range of properties and had demonstrated to its partners that it was a professional mining firm. It no longer needed a "compulsory" program to pursue its objectives; it could attract properties and partners on its own merits. In addition, the corporation's interests were shifting to the development phase. It no longer wished to acquire a large number of new properties, but instead to delineate those it already possessed. Furthermore, its acquisition of a 20 per cent interest in Cluff Lake Mining and its 50 per cent share of the Key Lake mine had placed considerable cash-flow constraints on the corporation. This, in turn, led to charges that SMDC was "dragging its feet" in grass-roots exploration activity. And so there was little criticism from any of the interest groups when the newly elected, Conservative Saskatchewan government terminated the CEP program in October 1983 (Twigg 1982, 1).

Aggregate Rent-Capturing Potential

Examine the total rent-generation capacity of the system, using once again, the Proxy Key Lake mine (PKL), and concentrating on the distribution of public rent between provincial and federal governments. The results are shown in Tables 8 and 9. Note that the share of rent captured by government (federal and provincial) now ranges from 61 per cent to 73 per cent over the feasible price range of US \$25 to \$35/lb U_3O_8. Saskatchewan's corresponding share of total rent is 52 per cent and 63 per cent. SMDC's 50 per cent interest in the Key Lake mine results in a revenue transfer from the federal to provincial treasury of \$70-\$140 million, at selling prices of US \$25 to \$35. A 100 per cent provincially owned venture would generate a transfer twice as large as that shown. This is a good example of the potential ramification of Section 125 of the Constitution Act and the *Alberta Natural Gas and Gas Liquids Reference* case.

Table 8
Proxy Key Lake Mine
Distribution of Government Share of Economic Rent[1]
(millions of 1981 Canadian dollars)

Claimants	Average Selling Price (US$/lb U_3O_8)							
	15	20	25	30	35	40	50	60
Province of Saskatchewan								
- SMDC: return on equity[2]	-38.9	65.7	153.9	227.5	294.1	366.9	495.0	619.0
- Saskatchewan Uranium Royalty (SUR)	42.0	106.8	202.3	327.1	467.6	597.1	887.7	1,188.4
- Corporate Income Tax	17.2	37.4	59.4	81.7	102.0	121.0	162.3	201.5
Total to Province	20.3	230.2	415.6	636.3	863.7	1,085.0	1,545.0	2,009.0
Government of Canada								
- Corporate Income Tax	18.3	43.0	71.3	104.7	140.1	176.8	252.1	329.0
Total: All Governments	38.6	273.2	486.9	741.0	1,003.8	1,261.8	1,797.1	2,338.0
Total Project Net Present Value	206.6	500.7	794.8	1,088.9	1,383.0	1,677.1	2,265.3	2,853.4

[1] Assumes 50 per cent SMDC ownership, 10 per cent discount rate, inflation at 0 per cent. SMDC's payment for interest in the property has been deducted from SMDC's 50 per cent share of equity net present value as reported in Table 7; the resulting value is listed herein under "SMDC: return on equity".

[2] Includes traditional return on investment as well as 50 per cent of the federal government's corporate income tax receipts as shown in Table 7. The reason for this is that crown corporations have not traditionally paid income tax to other governments.

Table 9
Proxy Key Lake Mine
Distribution of Government Share of Economic Rent[1]
(percentage)

Claimants	Average Selling Price (US$/lb U_3O_8)							
	15	20	25	30	35	40	50	60
Province of Saskatchewan								
- SMDC: return on equity	-18.1	17.2	19.3	20.9	21.3	21.9	21.8	21.7
- Sask. Uranium Royalty (SUR)	0.3	21.3	25.5	30.0	33.8	35.6	39.2	41.6
- Corporate Income Tax	8.3	7.5	7.5	7.5	7.4	7.2	7.2	7.1
Total to Province	9.8	46.0	52.3	58.4	62.5	64.7	68.2	70.4
Government of Canada								
- Corporate Income Tax	8.9	8.6	8.9	96	10.1	10.5	11.1	11.5
Total: All Governments	18.7	54.6	61.2	68.0	72.6	75.2	79.3	81.9
Total: Equity Holders	81.3	45.4	38.8	32.0	27.4	24.8	20.7	18.1

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[1] Assumptions same as for Table 8.

Conclusion

Judged on pragmatic criteria, the NDP government was able to devise and implement a surprisingly successful strategy for economic development and rent appropriation. Although its success was due in large part to nature's kindness in supplying Saskatchewan with high grade ore bodies, provincial government policies clearly provided a framework conducive to economic activity.

The tax system was expected not only to capture for the state a "fair" share of the rents, but also to do so in a relatively neutral fashion. Under certain conditions, SUR also provides a generous treatment of investment activity. This undoubtedly helped overcome any reticence mineral firms may have had in the mid-1970s about investing in the province. By allowing firms to recover their initial investment before subjecting them to the graduated royalty, the government overcame in part the negative image created by the disputes surrounding the potash reserve tax and the industry's subsequent nationalization. SUR was presented simultaneously to the public as a strong rent-collecting device. This was achieved in part by drawing attention to the maximum tax rate of 85 per cent and by publicizing enormous, undiscounted government revenue estimates.

Public enterprise also was an important vehicle for successful development/rent appropriation policies. Although a mandatory joint venture program might have generated hostility, the actual level of business resistance appears to have been negligible, as demonstrated by the large number of private firms that willingly worked with SMDC under the CEP program. The degree of cooperation undoubtedly exceeded the government's most optimistic expectations. The problem quickly became the finding of funds to implement all the promising CEP ventures to the crown corporation.

There are a number of reasons for the widespread corporate acceptance of both SMDC and the CEP programs. Perhaps the most important is the up-front, clear-cut nature of the rules. In contrast to the potash situation and the federal government's 1980 National Energy Program, Saskatchewan uranium policy was almost totally devoid of retroactive elements. The private sector accepted the CEP program as a reasonable trade-off between commercial and political reality.

The second attractive element of the SMDC/CEP package was the government's willingness to take substantial risks. It implied, as the anti-nuclear lobby pointed out, that the government had decided to push ahead with uranium development. Given the anti-uranium mining stance adopted in many competing areas, such as Australia, and the long term political risk inherent in investing in South Africa, Saskatchewan became perhaps the only jurisdiction with high grade, large-scale reserves and an explicitly pro-development stance. This perception increased over time as the province invested more funds in SMDC and as conservative governments in British Columbia, Nova Scotia, and Newfoundland enunciated various anti-mining positions.

In effect, the "window" argument applied in reverse. It became unlikely that the provincial government would change the rules to the detriment of its private partners' and by joint venture its own interests. Furthermore, the SMDC/CEP program operated in other ways to increase the level of public support for uranium mining. If the activity subsequently proved to be a financial winner, the public would share in the bonanza. This placated those whose moral concern about nuclear technology could be assuaged with money. Both the mining industry and the government realized that without public support uranium mining could not proceed and that without rigorous public rent-capturing devices, public support might not be forthcoming.

In conclusion, the NDP's economic development/rent appropriation policies more than met the expectations of their creators. It must be stressed that this analysis has been restricted to financial elements only. Admittedly, numerous administrative problems have plagued the Saskatchewan uranium royalty, and potential inefficiencies, alleged to be inherent in direct government participation, have been ignored. Other important issues such as environmental impact, occupational health and safety, aboriginal land rights, and the morality and ethics of uranium technology also have been ignored.

Notes

1. "Forward value" like "present value" is an operation that generates a value, at one point in time, equivalent to a dated series of cash flows over time. Whereas present value yields the value at the beginning of the series, forward value yields the value at the end. For present value, cash flows are discounted – at some predetermined discount rate – before being summed; the later the date of the cash flows the more heavily it is discounted. Conversely, for forward value cash flows are augmented – at some predetermined rate – before being summed; the earlier the date the more heavily augmented. The predetermined rate – equal to the interest factor (IF) – is 110 per cent of the chartered bank prime lending rate as published by the Bank of Canada.

2. Note that the following analysis is based on the tax laws in place on December 31, 1982. This rate, which pertains to incremental revenue, not taxable income, is readily found by adding up the various maximum rates: graduated royalty (SUR) – 48.5 per cent; basic royalty (SUR) – 3 per cent; federal corporate income tax – 27 per cent; and the Saskatchewan corporate income tax – 6.8 per cent. The sum is 85.3 per cent.

3. The primary sources are the various submissions to the Key Lake Board of Inquiry which submitted its *Final Report* to the Saskatchewan Department of the Environment on January 12, 1981. In addition, interviews were conducted with officials of the Saskatchewan Mining Development Corporation (SMDC), Saskatchewan Department of Energy and Mines, and the Planning Bureau of the Executive Council. The latter process generated a significant amount of unpublished material that aided the author in developing a plausible view of the underlying cost structure of the Key Lake mine. The interested reader should also see Holman (1982).

4. This estimate is based on a review of the long-term spread between the long-term corporate borrowing rates and the rate of inflation. There has been no attempt made to be precise but merely to propose plausible numbers. In order to address the obvious concerns raised by this approach, the analysis was subjected to alternative values of the interest

factor. The overall results are remarkably insensitive to a broad range of feasible values.

5. Given the current spot price of U_3O_8, the "base case" estimate may be somewhat high, but on the other hand, it would appear to be a reasonable estimate of the long-term price negotiated by both Saskatchewan and Australian producers at the time of empirical analysis (1981-1982). Since emphasis is on the life of the mine, the long term dominates. Nevertheless, alternative values ranging from US $15 to US $60/lb are employed in the analysis and fully reported in the text. The exchange rate utilized in the study is US $1 = C $1.20. This is approximately the 1981 average rate.

6. The approach used in this study is the traditional method employed in rent distribution studies. However, one aspect of the methodology has recently been questioned: see Copithorne et al. 1985, 472. The point at issue is that the level of corporate income tax on normal profit in a rent-free project is the opportunity cost of diverting investment funds to a resource project. Accordingly, this level of corporate taxes should, it has been argued, be considered a "tax opportunity cost" and be deducted in any rent calculation.

   Nevertheless, even if this criticism stands, the methodology adopted herein estimates total rent and the NPV of government receipts (not necessarily all appropriated from rents). Furthermore, a crude estimate by the author suggests that in the context of this study, the maximum error is approximately $15 million; this is less than 1.5 per cent of total rents at a selling price of US $30, and less than 1.0 per cent of the same at a price of US $40.

   In summary, the traditional approach was adopted because it is widely understood and accepted. The logic of the alternative approach is debatable, and the error, if any, is negligible.

7. The purchase price was US $79.25 million; this corresponds to C $93.054 million as at March 31, 1979.

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Chapter 6:

The British Columbia Forest Sector: Pros and Cons of the Stumpage System

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Richard Schwindt

Forestry dominates the economy of British Columbia. The sector includes numerous primary and processing industries which differ markedly in size, employment, output, markets, and technology. When operating near capacity, these industries directly employ nearly 100,000 people and, depending on the multiplier chosen, generate another 90,000-170,000 jobs.[1] All told the sector employs more than 15 per cent of the provincial labour force and accounts for more than 35 per cent of the value of the province's manufacturing shipments. Clearly, the performance of British Columbia's economy is tied directly to the performance of the forest sector.

British Columbia's forest lands are almost entirely owned by the provincial crown. As part of the Confederation bargain, the *British North America Act* granted control of timber resources to the provinces. Two decades later, the British Columbia government ceased the alienation of crown timber lands. In 1986, title to 94 per cent of the province's forest lands was held by the provincial crown; 1 per cent was controlled by the federal government; the remainder was owned by private interests. While the crown maintains property rights over the resource base, private enterprise carries out most of the harvesting, processing, and marketing of wood fibre.

The sector's paramount role in the economy and public ownership of the resource base present policy-makers with dual, interrelated goals: promotion of healthy, private industries, and extraction from those industries of the full value of the raw material input. This chapter deals with the effectiveness of public policy in achieving both these goals. It begins with a description of the resource base, sector participants, products, and markets.

Setting

The Resource Base

Forests cover roughly one half, or 47 million hectares, of the surface area of British Columbia. Three quarters of this area is considered to be economically accessible. Forest area, however, is a poor measure of the resource since it reflects neither timber volume nor quality. A crude quality distinction can be made between the higher-valued coniferous species and the hardwoods. Hardwoods are more abundant on a global scale than the conifers. But in British Columbia standing timber inventory is almost exclusively coniferous, with an abundance of the valuable Douglas fir, red cedar, and hemlock. British Columbia has an estimated standing inventory of 8,032 million cubic meters of mature softwood timber. This represents 50 per cent of the Canadian, 27 per cent of the North American, and 7 per cent of the world's inventory of timber. As shown in Table 1, British Columbia's share of this inventory was reflected in its 1980 harvest. The richness of British Columbia's resource endowment is illustrated by the fact that less than one tenth of 1 per cent of the world's population owns more than 7 per cent of its stock of softwood timber. This abundance, combined with proximity to major markets, explains British Columbia's strong position as an exporter of wood fibre.

Industry

The dimensions – in value of shipments, employment, establishments, products, and markets – of the main British Columbia wood-processing industries are set out in Table 2. There is considerable inter-industry variation.

Logging supports a large number of establishments because of the site-specific nature of the activity and absence of scale economies. These establishments are operated both by the major integrated firms and by relatively small, independent operators. Nearly all logs are processed, at least to some degree, within the province because of government restrictions on the export of raw logs cut from crown lands. Because of the pervasive level of vertical integration between timber holding and processing, very little raw material is subject to arm's length transactions.

Table 1
Distribution of Global Softwood
Standing Inventory and Harvest (1980)
(percentage)

	Inventory	1980 Harvest
USSR	57	25
Canada (excluding B.C.)	7	7
British Columbia	7	6
U.S.A.	12	20
Europe	9	19
Other	8	23
	100	100

Source: Council of Forest Industries 1984, 1-3.

The most important component of the sector, in terms of employment, is sawmilling. A large number of establishments exists, although this has declined markedly in the last two decades. The major product of sawmilling is dimension lumber, which is used principally in residential housing construction. The sawmilling industry is geared toward export markets, particularly the United States which absorbs about one half of the total provincial output of lumber. The health of the industry is tied therefore to the United States housing market. Chips, which are used in the pulping process, represent an important by-product of sawmilling operations and can account for up to 35 per cent of mill revenue, depending on location and the technology employed.

Although the plywood industry is smaller than either the logging or sawmilling industry, it also is significant in terms of employment and value of shipments. Historically, mills were located on the coast, but with the depletion of high quality Douglas fir "peelers" and the development of technologies which could use small-diameter logs, the industry moved to the interior of the province. Because of tariff and non-tariff (e.g. differing standards) barriers to trade, the British Columbia plywood industry is insulated from U.S. competition and excluded from U.S. markets. Production is directed toward domestic

Table 2
Characteristics of the British Columbia Wood Processing Industries, 1982

	Value of Shipments ($ millions)	Employment	Number of Establishments	Principal Products	Principal Markets (percentage)	
Logging	1,933	16,429	1,530	logs	B.C.	
Sawmills & Planing mills	2,679	28,943	320	chips lumber	B.C. U.S. Can.	 (50) (28)
Plywood & Veneer mills	402	5,877	29	plywood	Can. U.K.	(74) (11)
Pulp & Paper mills	2,433	16,779	23	newsprint Kraft pulp	U.S. U.S. Japan W.Ger.	(70) (26) (19) (14)

Sources: Statistics Canada 1982. Industry Interviews.

consumption, with some exports to traditional United Kingdom markets.

The pulp and paper industry ranks with sawmilling in economic importance. Due to significant scale economies, however, it supports relatively few establishments. The industry is geared to the production of two products, market pulp and newsprint, which together account for over 80 per cent of the value of shipments. Of these two products, market pulp is the most important.

In 1982, British Columbia produced 4.8 million tonnes of wood pulp. About 45 per cent of this was "captive"; the producing mill processed the pulp into paper, mainly newsprint. The remaining 55 per cent was designated market pulp and was sold primarily to foreign papermakers who add it to their native pulps in order to upgrade the quality of their paper.[2]

Newsprint is produced mainly for export, with the western United States absorbing most of the output. Market pulp is sold world wide with principal customers in the United States, Japan, and the European Economic Community.

Industrial Organization

Based upon numbers of establishments (Table 2), it appears that the logging, sawmilling, and plywood industries are atomized, while the pulp and paper industries are very concentrated. That appearance is misleading. In fact, the sector is dominated by a relatively small number of large, vertically integrated, multi-product forest companies. The industrial structure of the sector has been strongly influenced by the government's policy for allocating harvesting rights on crown lands. Over time, public policy has encouraged the larger processors to assume rights over, and management responsibilities for, large tracts of crown lands. Control over the resource led to control over the intermediate production stages.

Current levels of concentration in harvesting rights and process capacity are set out in Table 3. The 10 largest enterprises, in terms of allowable cut, hold nearly one half the cutting rights in areas subject to management regulations. This understates their actual holdings because these firms hold the majority of unregulated timber lands which provide up to 20 per cent of the harvest. These same enterprises account for only 39 per cent of sawmilling capacity but high percentages of plywood, newsprint, and Kraft pulp capacity. Moreover, these statistics ignore intercorporate links between the majors. For example, Noranda Mines Ltd. exerts effective control over both Northwood Forest Industries Ltd. and MacMillan Bloedel Ltd. and has equity

Table 3
Control of Harvesting Rights and Processing Capacity, B.C. - 1983 by Enterprise

	percentage of annual allowable cut	percentage of Capacity - 1983			
		Lumber	Plywood	Kraft pulp	Newsprint
MacMillan Bloedel	10.3	7.7	16.2	11.0	57.9
B.C.Forest Products	7.0	5.9	4.1	11.6	19.7
B.C. Timber	6.8	3.7		13.1	
Northwood	4.4	4.1		11.9	
FOUR	28.5	21.4	20.3	47.6	77.6
Weldwood	4.3	3.6	29.4		
Crown	3.5	2.8	15.9	4.3	22.4
Eurocan	3.0	1.0		6.9	
Canfor	2.7	2.5	8.3	12.3	
Weyerhauser	2.6	3.9		9.5	
West Fraser	2.5	3.9			
TEN	47.1	39.1	73.9	80.6	100.0
Enterprises with majority foreign ownership	36.5	33.1	43.2	26.4	22.4

Sources: British Columbia. Ministry of Forests. annual. Southam Business Publication. 1985.

connections, through the Bronfman Group, with British Columbia Forest Products. There are also a number of important joint ventures such as the holding of Western Forest Products by Whonnock, Doman, and British Columbia Forest Products.

Foreign-controlled enterprises play an important, but not dominant, role in the sector. They hold about one third of the allowable cut and have a similar proportion of sawmilling capacity. They account for a somewhat greater proportion of plywood but a smaller share of newsprint and Kraft pulp capacity (Table 3). Overall, the foreign presence in the sector is less than the average for Canadian manufacturing.

Labour

The British Columbia forest sector is heavily unionized. Union officials estimate that approximately 64 per cent of the workforce in logging and shake and shingle mills, and 85 per cent of sawmill, plywood mill, and veneer mill employees are union members. The pulp and paper mills are completely unionized. Workers in the logging and wood products (i.e. lumber, plywood, shakes, and shingles) industries are represented by the International Woodworkers of America (IWA). Pulp and paperworkers are represented by either the Canadian Paperworkers Union or the Pulp Paper and Woodworkers of Canada. The IWA is the most important of the three.

Government

The British Columbia government oversees management and exploitation of crown timber through the Ministry of Forests. This ministry is explicitly directed by legislation to encourage maximum productivity, manage the resource having regard for short and long-term economic and social benefits, plan for multiple use, encourage an efficient processing sector, and assert the financial interest of the crown in a systematic and equitable manner.

The contribution of the sector to public revenues is highly variable. In fiscal 1973-1974, direct sector payments for timber represented 20 per cent of provincial government revenues. This slipped to 1.5 per cent in fiscal 1982-1983. When indirect payments, including corporate and personal income tax, are included, the total contribution has ranged from 10 per cent to 33 per cent of provincial public revenues over the last decade (Table 4). Currently, public expenditures to operate the Forest Service exceed direct payments for timber.

This admittedly cursory review of the British Columbia forest sector leads to several generalizations. British Columbia

Table 4
Direct and Indirect Contributions of the Forest Sector to B.C. Public Revenues
($ Millions)

Fiscal Year	Direct Payments[1]	Direct Payments as per cent of Provincial Revenue	Indirect Payments[2]	Total Payments[3]	Total payments as per cent of Provincial Revenue
82-83	75	1.5	n.a.		
81-82	95	1.7	457	$552	9.9
80-81	344	7.3	406	750	16.0
79-80	565	12.0	429	994	21.2
78-79	283	8.4	379	662	19.6
77-78	105	3.5	323	428	14.4
76-77	63	2.6	236	299	12.4
75-76	43	2.0	181	224	10.5
74-75	131	7.5	202	333	19.1
73-74	267	19.9	181	448	33.4

[1] Includes stumpage, royalties, rents, and interest charges.

[2] Logging income tax, timber and property tax, B.C. corporate and personal income tax, B.C. sales tax, fuel tax.

[3] Direct payments plus indirect payments.

Source: Council of Forest Industries 1983, Appendix D.
B.C. Ministry of Forests, annual.

has a comparative advantage in the production of softwood fibre, based upon a rich, native timber endowment. The resource is owned by the public but is harvested, processed, and marketed by private industry. Large vertically integrated, multi-product companies play a significant role in the sector. Foreign-owned enterprises are present but do not dominate the sector. Producers depend heavily upon three commodity products – lumber, market pulp, and newsprint – and chiefly upon one foreign market, the United States. The stage is now set for an analysis of the system of resource rent collection.

Systems of Rent Capture

Over the last century the crown has used numerous techniques to allocate public timber to private interests and, in the process, attempted to extract some valuable consideration for the use of the resource. This consideration has been a combination of some general social benefit (such as local employment) and monetary remuneration. In order to understand the current method of crown timber pricing, it is necessary to trace the evolution of the system of allocation of harvesting rights and the obligations attached to that system. This section begins with a history of allocation and pricing of crown timber, and ends with an analysis of the current system.

History

In the earliest period of European settlement, the forests of British Columbia generated little, if any, surplus value. To the pioneers, standing timber was probably as much an impediment to settlement as an asset. Before inauguration of the Canadian Pacific Railway, supply was so overwhelming, compared to local demand, that standing timber was essentially a free good. In those early days, timber lands were conveyed to the private sector through crown grants which conferred fee simple title to the land and everything on it. The crown captured rents only to the extent they were embedded in the sale price. While these grants covered very limited areas of forest lands considering the provincial total, they tended to include some of the richest, most accessible timber stands. Crown-granted lands still account for up to 10 per cent of the provincial harvest.

In 1865 a *Land Ordinance* introduced mechanisms for allocating timber harvesting rights without alienating the actual timber lands. The first of these were the Timber Leases which were restricted to those actively engaged in the commercial exploitation of the resource. These early leases carried no royalty charge, but the crown extracted a "valuable consideration" in the form of industrial development. Vestiges of this policy of eschewing a direct charge for the resource in the pursuit of more general public goals such as development are to be found in current stumpage policies. In simple terms, some portion of the available rents are left with the industry which in return is expected to assume cost-increasing social responsibilities such as dispersing logging employment.

While the first Timber Leases did not bear a royalty, the *Land Ordinance* did allow that charges might eventually be imposed. This happened in 1884 with passage of "an Act Relating to the Cutting of Timber upon provincial Lands, and for the purpose of Deriving a Revenue therefrom." Early charges included both a flat fee per tree felled and a fixed fee per unit of volume. This was replaced in 1888 with a fixed royalty on volumes harvested. The 1888 legislation also reinforced the notion that leases were to encourage processing within the province. Many of the early tenures included appurtenancy clauses which required the construction of mills to process the allocated timber. Eventually, legislation (which remains in force today) was passed requiring that with limited exceptions, all timber cut on crown lands be processed to some extent within the province.

From the perspective of rent collection, the fixed royalty on volume suffered two severe flaws. It neither recognized the significant difference in the value of species within a given stand, nor that spatially separate stands had different values. The system encouraged "high-grading", both in terms of species and location. And the fixed fee ignored changes in value over time.

These problems were partially addressed in the policy revisions of 1905. New transferable licences were created, automatically renewable for extended periods and subject to changes in royalties when market conditions warranted. The introduction of these licences coincided with a general increase in the demand for British Columbia timber brought on by the exhaustion of the Eastern white pine forests, the construction of the Panama Canal, and economic expansion in Western Canada. Transferability, long terms, and the absence of mill appurtenancy clauses made the new licences extremely popular with speculators, and between 1905 and 1907, more than 15 thousand licences covering some 3.6 million hectares of forest lands were taken up. While the government of the day was delighted with the increased revenues from these allocations (forest revenues increased from $487 thousand in 1905 to $2.4 million in 1908), there was disquiet over the speed and extent of the licensing. At the end of 1907, licensing was suspended.

While the 1905 legislation allowed for royalty adjustments, these were not implemented until passage of the *Timber Royalty Act* of 1914. This *Act* provided for changes in royalties and for variable charges according to species, quality, and location. The 1914 *Act* was heralded as introducing a "modern theory" of rent capture:

> . . . the passage of the *Timber Royalty Act* . . . attracted widespread attention on account of its bold application of the modern legislative theory which calls for the retention by the state of a due share in the unearned increment upon natural resources (Cited in Reed 1975b, 2).

These early licences, collectively called Old Temporary Tenures (OTTs), provided the main source of access to crown timber prior to the Second World War. The rent collection mechanism from these OTTs is essentially royalty payments, although they are subject to other levies including rental fees, forest protection taxes, and forest land taxes. The royalty schedules can be adjusted, but this is done infrequently. For example, from 1914 to 1973, the royalties on both number 1 cedar and number 2 fir were changed just eight times. More importantly, royalties have failed to reflect the true value of standing timber (Task Force on Crown Timber Disposal 1974a, 67).

While the OTTs were the source of most of the timber harvest up to the late 1940s, licences introduced in 1912, known as "Timber Sales", became increasingly important. It was recognized that more than enough timber had been alienated through the OTTs to satisfy foreseeable demand, but that flexibility required some minor form of access. Timber Sales were intended, for example, to allocate small forest tracts adjacent to an OTT in order to rationalize the harvest. Timber Sales were offered in response to a specific application and were allocated by auction, although commonly they were so situated as to minimize competitive bids. As demand for fibre increased and the supply from the OTTs diminished, the Timber Sales became more important.

Timber Sales were subject to royalties and, more importantly, stumpage payments. Forest Branch appraisers estimated both the value of the timber to be cut and the costs of the harvest; and by subtracting the latter from the former, they set a minimum or "upset" price for the stand. The licences were allocated by bidding, with bids starting at the upset price. On the surface, this system of allocation appeared ideal. The crown would set a floor price on the resource to avoid gross irregularities, and then open-market bidding would determine the ultimate transaction price. In theory, the most efficient operator would outbid all others, guaranteeing efficient allocation of the resource and maximum returns to the crown. In practice, the element of appraised stumpage remained, while competitive bidding was abandoned for several reasons.

From the outset, the bidding process was flawed. The core problem was the difficulty in creating a true market. Raw logs have a low value-to-weight ratio, and therefore transportation costs tend to narrowly bound a specific stand's potential purchasers. In many instances, there was only one interested purchaser, and the sale would be made at the appraised upset price. The appraisal, then, became the crucial datum in the pricing, and not merely a monitoring device as intended.

More important to the demise of open bidding was the removal of large timber tracts from the system. This was done in the name of forest management. In the mid-1940s it became widely accepted that management of the British Columbia forests was severely deficient. The resource was being treated as "exhaustible"; operators would log a site and then move on with little regard for regeneration. This changed with the implementation of "sustained yield", which in simple terms meant the balancing of harvest with regeneration to ensure a perpetual supply of fibre. In practice the policy called for the determination and enforcement of sustainable (allowable) annual cuts for specific timber lands and the reforestation of logged or burned-over sites. At issue was who would assume responsibility for forest management, the public or the private sector. Both, as it developed, were to play a role. Private working circles, subsequently called Tree Farm Licences (TFL), were created to provide a secure raw material supply to large processors, in return for which the licensee would assume management responsibility (At the outset they were allocated in perpetuity). Most of these processors already held OTT's, and as an inducement to bring these unregulated lands under sustained yield, the government offered large tracts of crown lands to be combined with the OTTs into a TFL. The large forest companies welcomed this policy initiative; and within a decade, a sizeable portion of the forest resource had been brought under private management and control. Under the terms of the licences, the OTT's would continue to bear royalty charges while the supplementary crown timber was to be sold at appraised stumpage prices. Since the holder of the licence had the exclusive right to these resources, competition was precluded and the "upset" price prevailed. Today, 33 TFLs, accounting for 27 per cent of the allowable harvest, are in existence.

At about the same time, public working circles – later called Public Sustained Yield Units (PSYUs) and now organized into Timber Supply Areas – were created.

> PSYUs were intended to be the publicly managed counterpart of TFLs to support that segment of industry, including the independent market logger on the coast and the sawmill operator in the interior, who was either not interested in TFL or not equipped to manage it. . . . (the) small size of PSYU stemmed from the idea of community forests and did not take account of imbalances in age classes and operator locations and the need to develop certain geographic areas according to long-term plans. (Ainscough 1976, 43-44).

Harvesting rights within the publicly managed forests were to be distributed through competitive bidding, with the upset price as the base. However, the operation of the PSYUs did not develop as intended because the Forest Service, as it determined the allowable cut compatible with sustained yield on these lands, found that many units were over-committed.

> The problem was one of finding equitable means of reconciling the harvest with the limits of the allowable cut where it was insufficient to sustain the existing cut of 'established operators' (a term that has since assumed considerable importance). The solution was the "quota" system, an informal administrative device that has developed into one of the basic elements of the tenure structure. (Pearse 1976, 70)

The Forest Service solved the problem by granting to established operators a proportion of the allowable cut in the unit equivalent to the proportion of the harvest which the operator enjoyed before the implementation of sustained yield. With time, this right to a specific percentage of the allowable cut became entrenched and known as an enterprise's "quota position". This practice, which began in the over-committed units, was extended to all. Cutting rights continued to be allocated by bidding, but quota holders seeking to replace expiring rights were given such advantages in the bidding process that effective competition for the harvesting right was precluded (Pearse 1976, 72). For example, in heavily committed units only a quota holder with an expiring licence could request the sale of a new harvesting licence. Furthermore, the quota holder needed only to match a competing bid, while all other bidders had to submit a significant, non-refundable bidding fee which was forfeited if the bid was matched by the quota holder.

Access to fibre within the PSYUs was further narrowed by the Forest Service's shifting of management responsibilities onto licensees. This practice was introduced in the late 1960s with the creation of Timber Sale Harvesting Licences (TSHLs) which conveyed to the operator the right to an annual cut within a PSYU, typically for a 10-year period. In return the operator assumed planning, protection, and reforestation responsibilities. Very quickly the TSHL became the primary form of tenure in the PSYUs. And with the entrenchment of quota positions and the shifting of management responsibilities came the concentration of holdings. In 1986, 10 companies control over one half of the allowable cut in the publicly managed forests.

Within twenty years of implementation of sustained yield in British Columbia, competitive markets for the timber resource were closed. This was done by design in the TFLs and by default in the PSYUs.

This admittedly synoptic review of the evolution of British Columbia timber allocation policy leads to a threefold classification of timber lands based upon the incidence and type of crown charges. Timber on crown-granted lands is subject to minimal or no charge. Harvesting rights allocated through OTTs prior to 1907 are subject to royalties or, at the operator's discretion, stumpage. Most other timber is subject to appraised stumpage. The relative importance of these categories, in terms of volume of timber cut and revenues, is set out in Table 5. Over the 1979-1983 period, stumpage-bearing timber accounted for 80 per cent of the cut and 97 per cent of aggregate stumpage and royalty revenue. Timber subject to royalties represented 10 per cent of the cut, but contributed only 3 per cent of the aggregate revenues, while private lands supported 9 per cent of the harvest and were subject to neither stumpage nor royalty charges. Stumpage-bearing timber is clearly the most important in terms of forest area, harvest, and revenue. The system of stumpage appraisal thus warrants careful consideration.

Current Stumpage System

In theory the most straightforward method of assigning a value to standing timber is to organize a competitive auction and allow market forces to determine price. In reality it is very difficult to

Table 5
Relative Importance of Stumpage Bearing and Royalty Bearing Timber
1979-1983

	percentage of forest land (1975)	percentage of harvest	percentage of total stumpage plus royalty revenue
Stumpage-bearing lands:	90	80	97
Royalty-bearing lands:	1	10	3
Crown Grant lands:	5	9	--

Source: British Columbia, Ministry of Forests annual. Royal Commission on Forest Resources 1976, 26.

organize a competitive auction market for standing timber. The nature of the resource and public policies both tend to restrict the number of potential bidders for any given timber stand. Stumpage has therefore come to be calculated by subtracting the appraised costs of harvesting and transportation from the appraised value of the timber upon delivery at a market or processing center. The actual formula employed in British Columbia is a modification of the Rothery System, developed by an American forester, Julien Rothery, in 1945.

The stumpage formula is:

$$S = R - C - r(C + S),$$

which is equivalent to:

$$S = \frac{R}{1 + r} - C,$$

where

R = selling price of timber
C = operating costs
S = stumpage
r = profit and risk factor.

Stumpage is cast as the residual after operating costs, C, and an "allowance for risk and profit", r(C + S), have been deducted from the selling price of the timber, R. Application of the formula is best seen by an example. If R is \$10/m^3, C is \$6/m^3, and r is 15 per cent, then the above formula yields a stumpage of \$2.70/m^3.

The efficiency with which the application of this formula captures available rents obviously depends on the values assigned to the variables R and C and the magnitude of the parameter r. It must be emphasized that this is an *appraisal* system, and thus R and C are estimates and not market-determined values. How then are these values determined?

The value of the fibre from which costs are deducted, R, is clearly a crucial datum. Two procedures are used. For timber cut in the coastal forests of British Columbia, prices generated on the Vancouver Log Market are used as the basis for estimating the value of the cut. It is widely recognized that this market is an imperfect instrument for determining values. Only a small proportion of the coastal cut actually passes through this market. And a significant proportion of its transactions involve log trades between major processors rather than arm's length transactions based on price (Task Force on Crown Timber Disposal 1974b, 37).

In the British Columbia interior, timber values are based upon the selling price of two end-products, lumber and wood chips. A sample of actual transaction prices for lumber is combined with an official chip price (well below current value) to determine a composite, end-product value. A lumber recovery factor is used to determine the lumber and chip content of a log, and the end-product value is applied to this content measure to derive the value of the log. Both coast and interior appraisal values are calculated on the basis of a three-month moving average. As the price of logs or lumber changes, this will be reflected in stumpage charges.

Operating costs, C, are based upon the notion of an "average efficient operator". The Forest Service surveys a sample of operators and constructs a costing manual based upon the sample data. On the coast, operating costs include logging costs and the cost of transportation to the specified appraisal point, which is usually the nearest processing centre. The appraisal point need not be the actual location of the operator's processing facilities as the appraisal attempts to reflect market value not the value to the particular operator. Because the interior uses an end-product system, milling costs (also determined by industry survey) are included in operating costs. It should be noted that some costs incurred by industry on behalf of the province, such as the construction of main access roads and reforestation programs, are not included in the operating costs, but rather are deducted directly from stumpage owing.

The allowance for profit and risk is expressed as a percentage of operating costs plus stumpage in the basic stumpage formula. However, it can be shown that this allowance actually depends upon the selling price of timber.[3] This is curious because profit should reflect a return to capital. Neither the amount of capital employed nor risk vary directly with the selling price of timber. In a sense the industry is constrained to a regulated rate of return which is calculated using an inappropriate base. Furthermore, the risk allowance is site-specific and again determined by appraisal.

The stumpage system thus depends almost completely upon appraisals – timber values are appraised, costs are appraised, and risk is appraised. To ask whether the crown is capturing available resource rents is to ask whether these appraisals are accurate. Without the benefit of the monitoring function of competitive markets, an evaluation of the system must depend on indirect tests.

Existence of Uncollected Rents

A direct method of judging the accuracy of the appraisal system would be to examine critically each of the component steps. This would require large-scale, independent surveys of prices generated in the Vancouver Log Market, prices received by interior lumber producers, lumber conversion factors, logging costs, transportation costs, road costs, and the actual riskiness of particular harvests. This is a mammoth task, beyond the scope of this chapter, and possibly beyond the scope of the Forest Service itself. Instead, investigators have relied on indirect tests, particularly interregional comparisons of stumpage charges.

The U.S. Pacific Northwest provides a natural focus for such a comparison because the forest cover is physically similar to British Columbia and because timber on U.S. public lands is allocated by competitive bidding. David Haley, a University of British Columbia forest economist, compared stumpages paid for timber cut off comparable stands in British Columbia and the state of Washington. He concluded that:

> Stumpages for crown timber in British Columbia are considerably lower than for public timber in the United States Pacific Northwest, and these price differences are increasing annually. There is little doubt that the principal reason for higher stumpages

> in the Pacific Northwest is that all public agencies, both state and federal, involved in timber production, encourage competitive bidding for standing timber whereas in British Columbia competitive sales for public timber have been virtually eliminated. . .
>
> The evidence (is) . . . that appraised stumpages in British Columbia fail to reflect the full value of the Province's timber resource and that, in the absence of competitive markets for stumpage, public revenues from the production and sale of timber are much lower than they could be. (Haley 1980, 229-230).

In 1981, one year after the publication of Haley's research, the issue of stumpage comparisons moved from esoteric academic journals into the arena of international trade disputes, where it has remained up to the time of writing (late 1986). United States lumber producers have used such comparisons to substantiate their claim that low stumpage charges have constituted an export subsidy to British Columbia producers, and they have demanded that this be remedied through the imposition of a countervailing tariff on Canadian lumber. Given the importance of the U.S. market to provincial producers, the threat of a tariff is extremely serious.

No one has challenged that U.S. producers pay more stumpage than their British Columbia counterparts. The issue is whether there are lower resource rents available in the British Columbia forest sector. In their defence Canadian producers argued that the value of standing timber was less because harvesting costs were higher in British Columbia than in the U.S. Pacific Northwest. Therefore the surplus available for stumpage was less, which explained the observed interregional differences in stumpage paid.

The comparative analysis provided by representatives of the British Columbia industry to the United States International Trade Administration has been extremely detailed and complex, and cannot be rigorously dealt with here. However, several generalizations can be made. The discrepancy in stumpage could not be explained by differences in the value of standing timber insofar as this is measured by species-mix and timber quality. The difference in residual values could be explained in part by higher operating costs in British Columbia. However, the costs that were compared were United States Forest Service *appraised* costs and British Columbia Forest Service *appraised* costs. Again, the issue hung on the accuracy of public sector estimates of private sector costs. No attempt was made to check the accuracy of these estimates, and thus no definitive statement can be made.

In addition to the disputed interregional stumpage comparisons, there is other indirect evidence which suggests that the crown does not capture all available rents. One such measure is the exchange value of harvesting rights. Theoretically the market value of a right to cut timber should reflect the present value of the stream of future net returns, or rents. If the crown were expected to capture all net returns, with only normal returns going to the operator, the harvesting right would have little if any market value. Harvesting rights do have substantial market value, and in the view of the British Columbia Task Force on Crown Timber Disposal, this represents *prima facie* evidence that the crown fails to extract all rents from the resource (Task Force 1974, p. 124).

A detailed review of the value of harvesting rights was done by Ian McAskill (1982) who considered the timber component of the share value of MacMillan Bloedel Ltd. and a valuation of West Fraser Timber's cutting rights. He found that crown-granted, royalty-bearing, and stumpage-bearing timber all commanded substantial market values. Because of the narrowness of the sample and a number of confounding factors, he could not estimate the extent of the anticipated net returns. At most he could conclude that such returns existed.

The emergence of a new and relatively competitive market for timber in British Columbia provides an additional piece of evidence suggesting that stumpage charges do not exhaust the resource rent. In an effort to help smaller operators, the government introduced the Small Business Enterprise Program in 1980. Under this program, harvesting rights are allocated by competitively organized auction markets. Remarkably, in the 1980-1981, 1981-1982, and 1982-1983 fiscal years, average bids exceeded minimum appraised stumpage by 186 per cent, 269 per cent, and 205 per cent, respectively. Over the same period, stumpage received from non-competitively allocated timber was generally at, or near, the minimum appraised value. To date no compelling argument has been made to explain this apparent discrepancy, other than the differing degrees of competition in the two forms of allocation.

Finally, work for the Economic Council of Canada provides further evidence of the existence of uncollected resource rents. Lawrence Copithorne (1979) used two techniques to address the issue. First, he quantified the surplus which the timber resource produced over normal returns to labour and capital. He identified this surplus as the difference between the actual returns to labour and capital in the primary sector (i.e. primary value added) and the opportunity cost of these inputs in alternate, non-primary activities. This exercise produced an estimate of an annual average "windfall" for 1970-1973 of between $453 million and $506 million depending on what opportunity cost (i.e. what alternate wage) was attached to labour. Copithorne recognized that this windfall exceeded the value of rent to the extent that risk premiums are required to attract capital and labour into high-risk activities such as the forest industry. The windfall measure also combines economic scarcity rent with rent arising from locational advantages and monopoly rent due to barriers to market entry.

Second, Copithorne employed an extremely detailed linear programming model to estimate potential rents under varying assumptions. He concluded that:

> . . . the model demonstrates that, if labour and capital had free entry to the industry and if log exports were permitted, the economic rents could be made several times larger than the $85 million worth of stumpage actually collected on average in British Columbia during 1971-73. (Copithorne 1979, 167)

In a recent study for the Economic Council, Percy (1986) updated Copithorne's work, again using the difference between value added and the opportunity cost of inputs as a measure of the windfall attributable to the timber resource. For the logging industry alone, his estimates for the 1979 windfall ranged from $680 to $752 million, and from $1.1 to $1.4 billion for the total forest industry. Using different assumptions, he concluded that government had captured between one third and two thirds of the windfall through stumpage, royalties, and fees (Percy 1976, 39).

In summary, there is diverse evidence that the crown has failed to collect all available rents. If they have not been directly captured by the public, who are the recipients?

The Distribution of Uncollected Rents

While there have been numerous suggestions concerning the distribution of rents which have escaped the stumpage system, no systematic study has irrefutably documented their capture or dissipation by other groups. Using a private interest theory of regulation, it has been argued elsewhere that the three major interest groups which participate in the sector, namely the provincial government, organized labour, and the forest product companies, bargain over rent distribution (Globerman and Schwindt 1985).

Provincial Government

It is possible that the government indirectly captures resource rents by imposing socially beneficial constraints on the operation of the sector. The government explicitly recognizes that the timber pricing system has goals other than the maximization of crown revenues. For example, the system should serve the objective "of reducing the cyclical instability of the provincial economy"; it should "encourage a vigorous, efficient, and world-competitive timber processing industry", and it should be "in harmony with other management objectives" (British Columbia, Ministry of Forests 1980, 8).

In fact rent collection ranks last among the criteria the *Forest Act* sets out for the chief forester's evaluation of Forest Licence applications.

> The chief forester shall evaluate each application, including its potential for:
>
> a. creating or maintaining employment opportunities and other social benefits in the Province;
> b. providing for the management and utilization of crown timber;
> c. furthering the development objectives of the crown;
> d. meeting objectives of the crown in respect of environmental quality and the management of water, fisheries, and wildlife resources; and
> e. contributing to crown revenues.
>
> (*Forest Act*, Part 3, Section 11(4))

The maintenance of employment (particularly in remote areas), the encouragement of investment, and other resource management objectives, such as improving environmental quality and using biological criteria to regulate the harvest, all have the potential for lowering the residual value available for stumpage charges. Under this interpretation, government essentially uses industry to achieve broad social objectives and pays for this service through forgone stumpage.

The disbursement of rents under such a scenario defies evaluation. It is possible that government implicitly commissions private industry to assume and discharge social responsibilities, such that the social benefit outweighs the social cost in terms of forgone rents. But there is no systematic evidence to indicate that forest sector employment is more stable, worker safety greater, environmental degradation less, or forest products companies more socially responsible in British Columbia than elsewhere. That forgone stumpage is captured indirectly by the crown is a plausible hypothesis, unsubstantiated by hard evidence.

Labour

The rent-in-wages theory postulates that labour is able to capture a portion of the rents at the bargaining table. On the surface this seems a reasonable hypothesis when one considers the level of organization and militancy of trade unions in the British Columbia forest sector and the fact that wages enter the stumpage calculation as a component of operating costs which ultimately reduce stumpage owed.

Copithorne (1979) tested this hypothesis in a study for the Economic Council of Canada. Although he found the hypothesis plausible, his analysis could not prove that rent was passed on in wages. Percy updated Copithorne's wage data and found that, over the 1970-1981 period, wages in the forest industries of British Columbia were higher than Ontario. While this evidence supported Copithorne's hypothesis of rent-in-wages, Percy concluded that in fact wage differentials were attributable to productivity differences, not rent capture. (Percy 1986).

The Council of Forest Industries, which draws its membership from the forest products companies, has carried out several studies comparing wood industry wages in British Columbia with those paid in the U.S. Pacific Northwest. The results have been inconclusive. In the early 1970s British Columbia wages appeared higher, and in the early 1980s lower (COFI 1973; COFI 1981).

Of course wages are not the only form of labour remuneration. It is possible that rents support non-wage benefits such as employment, job security, seniority systems, or enhanced working conditions. For example, Copithorne argues that the province forgoes rents through its embargo on the export of raw logs but that if the embargo were lifted, half the sawmilling jobs in the province would be lost. He notes that dropping the embargo would "flush both the rents from the forest and the government from office with uncommon success" (Copithorne 1979, 140). If Copithorne's model is correct, rents are dissipated through the maintenance of the sawmilling industry, regardless of whether sawmill workers earn more than their opportunity cost. It is unclear, however, who benefits from this dissipation.

Government forgoes revenues but avoids being "flushed from office", and labour enjoys more employment in sawmilling than would exist in the absence of the export prohibition.

Business

Other likely recipients of timber rent are the forest products companies. There are two possibilities. The companies might capture the rent and thereby enhance their financial performance, or they might capture but dissipate those rents.

The financial performance of the industry certainly does not lend support to the capture-and-retention hypothesis. Poor profit performance is characteristic of the entire Canadian sector. (Pearse 1976; Woodbridge, Reed 1984). Admittedly accounting profits are subject to problems in interpretation due to differing accounting procedures, publication of aggregate data, and differing tax treatments. However, there is little doubt; the forest companies are not making above-normal profits.

This leaves the possibility that rent is dissipated. Dissipation could be attributed to either higher than necessary costs, or lower than possible revenues. Simply, potential rent could be lost if firms were either producing the wrong products, or the right products inefficiently.

It was suggested during the United States countervailing duty hearings that British Columbia producers received lower revenues than their United States counterparts because the latter enjoyed unique market opportunities such as the ability to export raw logs and proximity to major urban centers. It was argued that government restrictions on the export of logs from crown lands reduced the industry's potential net revenues. Much the same position was taken by the Economic Council of Canada in its study of western provincial economies (Economic Council 1984, 58).

More serious is the suggestion that forest product companies, in their pursuit of low-cost production of commodity products (primarily lumber, market pulp, and newsprint), have adopted a flawed strategy. This argument was used to explain the poor financial performance of the companies noted by the 1976 Royal Commission on Forest Resources (Schwindt 1979, 19) and was supported by reference to Richard Rumelt's (1974) analysis of the strategy and structure of United States industrial enterprises. Rumelt included forest products companies in the category of "dominant vertical integration". This designation was applied to mature, slow-growth industries using capital-intensive processing in the production of homogenous, semi-finished products. The alleged flaw in the strategy of these enterprises is that they emphasize efficient operation of complex, capital-intensive processes and undertake too little consumer marketing, product innovation, engineering of special products, and science-based research. (Rumelt 1974, 130). Rumelt also explains why enterprises in the "dominant vertical" category have difficulty escaping their low-performance strategy:

> Escape from these industries, however, is particularly difficult for the large vertically integrated firm. Its technologies tend to be based on process rather than science or product function and are not readily transferable. Large size implies that the scale of investment in new businesses must also be large if noticeable changes in corporate performance are to be achieved, but low price-earnings ratios and high pay-out policies make such investments financially quite difficult. Finally, the integrated businesses train few generalists, and their attitudes and the organizational structure they preside over tend to inhibit strategic change. Thus, unlike nonintegrated firms, the dominant-vertical companies have not, in general, significantly diversified in response to lower performance (Rumelt 1974, 139).

Five years later this argument was echoed in a study of the sector commissioned by the federal government:

> The consultants' principal theme is that the British Columbia forest products industry has become "locked-in" to a product-mix which reflects timber resource and processing technology superiorities which no longer exist. An upgrading of the province's product-mix is felt to be essential (Woodbridge, Reed 1984, i).

The report also commented on the production strategy of the industry:

> These ... [references] ... illustrate a basic point – the "production oriented" attitude of the British Columbia forest products industry. In an era when British Columbia could manufacture premium products which were much in demand by global markets, there was no compelling reason to do otherwise than to ensure that the industry achieved the best cost competitive position attainable (Woodbridge, Reed 1984, 16).

Much the same position is reflected in a recent report for the Forest Economics and Policy Analysis Project (Nilsson 1985).

Knowledgeable observers increasingly have concluded that forest companies misallocate forest resources by employing faulty product-mixes. On the other hand, there is inconclusive evidence that rents are dissipated through higher costs. It is known, for example, that logging costs (excluding stumpage) are significantly higher on the British Columbia coast than in other forest regions of Canada or the United States. Interior British Columbia logging costs also tend to be somewhat higher than in the United States or other regions of Canada except for Quebec (Woodbridge, Reed 1983, 42). It is not known, however, whether these costs are above an attainable minimum. Sawmills are said to be very efficient in the interior, but in need of modernization on the coast (Woodbridge, Reed 1984, 56-59). Pulp and paper mills, while not all "state-of-the-art", are viewed as reasonably efficient, particularly in comparison with Eastern Canadian mills (Litvak and Maule 1979).

While the current capital stock appears reasonably efficient (Nilsson 1985 predicts considerable obsolescence by the year 2000), two other elements of technical efficiency deserve attention. The first is "X-inefficiency" which deals with the use of existing capacity. Since the onset of the 1982 recession, there have been marked productivity increases both at the industry's production and management levels. The limited change in capital stock during the period suggests that earlier labour productivity was lower than it could have been.

Another element of technical efficiency is capacity utilization. The Pearse Royal Commission concluded that costs in the forest industry were higher than need be because of the burden of excess capacity (Pearse 1976, 49-50). Actually excess capacity, if defined as chronic idle capacity, is not a significant problem (Schwindt 1979, 19). What may be a problem, at least from the perspective of the forest companies, is the constant pressure to make preemptive investments as they compete for the position of low-cost producer (Rumelt 1974, 139).

Policy Alternatives

Indirect evidence strongly suggests that the stumpage system, because of both formulation and implementation, fails to extract all available resource rents. It is probable that some portion of this residual is indirectly captured by the public through the imposition of costly social responsibilities on the industry. It is also probable that labour, particularly unionized labor, captures some share. Most disconcerting is the mounting evidence that companies have dissipated rent through the misallocation of both capital and fibre. The disbursement of rents to labour or in the pursuit of social objectives involves a redistribution of wealth which may raise equity problems but is not necessarily inefficient. Dissipation of rents through a misallocation of resources does, however, incur net efficiency losses, a loss to society which is not matched by benefits to any group – business, labour or government.

How can these problems be mitigated? One alternative would be to move away from appraisals toward a market allocation of harvesting rights. Although increased use of competitive bidding is feasible, a wholesale movement toward competitive bidding is not realistic given the structure of the industry, the division of management responsibilities, and the entrenchment of private harvesting rights on crown lands. This leaves several alternatives for improving and monitoring the appraisal system.

First, obvious imperfections in the system should be removed. The Vancouver Log Market is far too thin to provide a reliable measure of log values. Measures to increase the volume of timber going through this market should be explored, and careful consideration of moving to an end-product appraisal system for coast timber should be made. Realistic chip prices should be used in the interior appraisals. Cost appraisals also deserve more rigorous scrutiny. Costing formulas inherently inflate costs because firms change input mixes in response to input price changes, a fact rarely recognized in the formula. Furthermore, auditing of actual costs should be expanded to test the accuracy of cost surveys. Finally, the profit allowance should be tied to capital employed, not sales.

Aside from the obvious changes to the appraisal system cited, most attempts to improve its accuracy will require more government effort in terms of manpower and expenditure. This involves an obvious trade-off between potentially increased stumpage revenues and increased expenditures to capture those revenues. While it is difficult to say how much effort is enough, as long as substantial amounts of unclaimed rents are suspected, some increased effort is justified.

More promising is a policy of at least some increased reliance on market forces. Attention should be directed to the prices being paid for timber sold under the Small Business Enterprise Program. This program, which is planned to account eventually for 10 per cent of the harvest, has reintroduced competition into the allocation of cutting rights. The proportion of timber allocated by competitive bid could be increased. Bids offered in this auction market could be used as a bench mark for appraised values on committed tracts. In addition, U.S. markets could be more systematically used as a monitor. Inter-regional stumpage and cost comparisons are admittedly difficult, but they can be done. Such comparisons have been performed in the past primarily by observers with limited resources (e.g. academics) or those with vested interests (e.g. the analysis provided by both sides in the lumber dumping investigation).

A monitoring of prices paid for exported logs would provide insights into the value of the timber resource. Export markets for raw logs are presumably competitive, and prices registered in these markets are not subject to the same potential biases as those in the Vancouver Log Market.

These policy suggestions could enhance the accuracy of appraisals. Furthermore, the disposition of potential rents should be explored. Of great interest is the possibility that forgone stumpage is indirectly used to pursue social goals. Such an allocation is subject to numerous problems. It is difficult to determine if the costs, in terms of forgone stumpage, are outweighed by the generated social benefits. And, since this is essentially a circuitous method of wealth redistribution, it is subject to abuse. The public if informed might not approve of the redistribution. If social policies are to be pursued, it may be better to collect the stumpage and then reallocate the revenues through normal, transparent, accountable procedures.

Finally, there is the possibility that rents are dissipated through faulty, strategic decision making by the forest products companies. If this can be shown, for example, through inter-regional comparisons of product mixes and performance, policy makers have two potential responses. At a minimum they should ensure that regulations do not distort investment decisions. For example, mill appurtenancy clauses attached to harvesting rights should be carefully evaluated in view of the potential market for the mill's output. Government obviously should avoid encouraging capacity expansion which puts pressure on product prices and ultimately results in lower stumpage. Policies which restrict timber to established enterprises should be tempered. They create a barrier to smaller, perhaps more innovative, entrants. At the other extreme, the province might take a more active role in supporting innovation, invention, and marketing in the sector. Clearly policies which enhance the value of the timber resource are ultimately in the public interest.

Postscript

As briefly discussed in Chapter 1, political controversy surrounds Canadian lumber exports to the United States. Over the last decade Canadian producers have increased their share of the United States market, and as a result American producers have escalated their demands for protection. This lobby has argued in effect that "differential rent" (see Appendix to Chapter 1) exists on British Columbia forests relative to the costs of producers in the United States Pacific Northwest and that British Columbia's stumpage system fails to capture this rent. The lobby concludes that the existence of uncollected rent constitutes an unfair subsidy justifying a countervailing United States tariff. The goal of the lobby is to increase the domestic United States price of lumber sufficiently to generate normal returns to the capital and labour employed in lumber mills in the Pacific Northwest. Canadian negotiators have argued that the inter-regional comparisons of stumpage, upon which the American producers' position is based, are seriously flawed and that in fact there is no subsidy. They claim that Canadian penetration of the United States market is in large measure attributable to the devaluation of the Canadian dollar and to the relative efficiency of Canadian producers. Whatever the merits of conflicting analysis, protectionist political forces within the United States have dictated that the price must be high enough to accommodate Pacific Northwest producers.

In 1983 the United States Commerce Department rejected an initial petition for a countervailing tariff, but in 1986 it acceded to a second petition and, pending a final ruling, proposed an interim 15 per cent tariff on Canadian softwood lumber. Canadian and British Columbia governments ultimately accepted the inevitability of an unfavourable ruling, and initiated bilateral negotiations on an alternative means to satisfy United States interests. An agreement reached in late 1986 imposed – in lieu of an American tariff – a 15 per cent Canadian export tax on lumber exports to the United States, the revenue from which is to be transferred to the governments of lumber-exporting provinces. Subject to further bilateral negotiations, the export tax may be replaced by increased provincial stumpage levels.

It is of secondary importance to the United States lobby whether the price increase is achieved by Congress imposing a tariff or by the Canadian Parliament agreeing to an export tax. The means is, however, important in determining the distribution of rent – between governments and industry, and between the two countries. Ironically, it appears that United

States protectionism will be the catalyst that finally prompts the British Columbia government to pursue more aggressively the public collection of forest rents.

Notes

1. See Reed (1975a), who cites multiplier estimates of between 1.9 and 2.7, and Canada, Department of Industry, Trade and Commerce (1978), which cites forest service estimates of 2.43 for Prince George, B.C. and 2.49 for the Okanagan.

2. Actually, the distinction between market and captive pulp is not simply based upon use or non-use by the producing mill. The bulk of captive pulp in the British Columbia sector is of the lower quality, mechanical type suitable for production of newsprint, while market pulp is the higher valued, chemical type (i.e. Kraft pulp). Mills cannot, in response solely to market conditions, switch between the production of market or captive output. In fact, many pulp mills are not integrated into paper making and therefore depend completely on sales of market pulp.

3. Let "A" be the allowance for profit and risk. Substituting for S in the identity $A \equiv r(C + S)$ yields,

$$A = r\left(C + \frac{R}{1+r} - C\right)$$

$$= \frac{r}{1+r} R$$

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Chapter 7:

Public Policy and the Pacific Salmon Fishery's Harvesting Crisis

Richard Schwindt

The Canadian Pacific salmon fishery differs markedly from the British Columbia forestry sector. It is of much less economic importance; it comes under federal government jurisdiction, and its history has unambiguously been one of resource rent dissipation.

Employment in the harvesting and processing sectors of all Pacific fisheries is estimated to be approximately 20,000, or 1.5 per cent of the employed provincial labor force (Shaffer 1979, 1). Together these sectors accounted for about 1 per cent of gross domestic provincial product. While small in aggregate terms, the exploitation of the marine resource base is extremely important to many smaller, remote coastal communities.

The federal government retains jurisdiction over the fisheries up to the point where marine products are landed. Federal authorities thus are responsible for the management of the resource, and any resource rents are rightfully the property of the federal crown. The provincial government, through its Marine Resources Branch, regulates the processing sector.

The fisheries have been operated for the most part as a "common property resource", with open access to the fishing grounds. The result has been a classic case of market failure, in which competition for the resource rent has induced chronic excess capacity in the harvesting sector. Public policy has emphasized preservation of the resource and, to a lesser degree, protection of fishermen's incomes. Only recently has the question of rights to resource rents emerged as an important public policy issue.

Overview

The Resource Base

The resource base is comprised of the fish stocks coming under Canada's jurisdiction off the Pacific Coast. There are a large number of commercially harvestable species, but salmon are of paramount importance. Over the 1975-1982 period, salmon accounted for nearly two thirds of the value of commercial fish landings (Table 1). It is estimated that under improved management the sustainable yield of salmon would be twice the current harvest (Commission 1981, 7).

Table 1
Value of Commercial Fish Landings in British Columbia by Species Groups: Annual Average, 1975-1982

	(millions of dollars)	per cent
Salmon	125.4	62
Roe herring	43.5	21
Halibut	11.5	6
Ground fish	11.1	5
Mollusc and Crustacean	7.8	4
Other	3.1	2
	202.4	100

Sources: Calculated from Canada, Fisheries and Oceans, annual; British Columbia Marine Resources Branch, annual.

The five Pacific salmon species – chinook, chum, coho, pinks, and sockeye – are anadromous. They hatch in fresh water, migrate to the ocean where they spend most of their lives, and then return to the freshwater stream of origin to spawn and die. This biological pattern has important implications both for the organization of the harvest and for the successful management of the resource. Salmon can be harvested very efficiently as they school at the mouths of the originating fresh water systems before the upstream migration. This is the ideal point of capture. The fish are easy to locate; they have reached their maximum weight, and their quality deteriorates rapidly as they approach the spawning ground. However, the ease of capture makes these species extremely vulnerable to overfishing. Additionally, the actual spawning grounds, which are often great distances inland, are vulnerable to both natural and human disruption. For these reasons conservation policies have focused on ensuring that an adequate number of salmon escape the harvest to reproduce and on protecting the freshwater spawning grounds.

Products and Markets

The product of the resource harvest is raw fish. The different species are close, but imperfect, substitutes in that some are more suitable for canning, others for freezing. The harvesting method is important because troll-caught fish (caught by line and hooks) are a higher quality. They are less bruised and better preserved than fish caught by seine net or gillnet.

The supply of raw fish is determined biologically. Salmon are subject to migration cycles which lead to fluctuations in the annual runs. This is reflected in Table 2 which shows extreme variation in the harvest of sockeye, pinks, and chum. Instability in supply has obvious impacts on the stability of fishermen's incomes.

Fishery end products fall into three categories: canned, frozen, and fresh. Over the last decade approximately 50 per cent of the wholesale value of processed salmon was attributable to canned product, 40 per cent to frozen, and the remainder to fresh, roe, and other products. A little more than half of canned production is consumed here in Canada, while the United Kingdom maintains its historical role as the main export market, accounting for about one half of all exports. Nearly all frozen salmon is exported, with France and, more recently, Japan the major customers.

Players and Prices

The principal participants in the fishery are the fishermen, processors, and government. These "issue-unified" groups have an obvious interest in the distribution of the resource rent and have, as will be argued, all participated in its dissipation.

Fishermen

As of December 1981, there were 4,739 vessels licensed to harvest salmon (Commission 1982, 80). Approximately 7 per cent of the fleet are seiners which account for about 43 per cent of the

Table 2
Landings, by Salmon Species, 1973-1982
(1000 tonnes)

	Chinook	Sockeye	Coho	Pinks	Chum	Total
1973	7.6	21.5	11.3	13.3	32.8	86.5
1974	7.6	21.7	10.4	11.2	12.5	63.4
1975	7.3	5.7	7.7	10.2	5.4	36.3
1976	7.8	12.3	9.3	17.1	10.9	57.4
1977	7.5	17.4	9.9	24.7	6.0	65.5
1978	7.9	22.3	9.2	15.3	15.9	70.6
1979	6.8	14.5	10.3	24.7	4.8	61.1
1980	6.5	7.7	9.0	13.7	16.8	53.7
1981	5.9	21.0	7.5	38.3	6.2	78.9
1982	7.1	30.1	9.3	4.0	15.1	65.6

Source: Calculated from British Columbia, Marine Resources Branch, annual.

harvest. Gillnetters, trollers, and combination vessels account for the remainder of the fleet and harvest.

While ownership of the fleet is relatively atomized, fishermen are grouped into several organizations including the United Fisherman and Allied Workers Union (UFAWU), the Native Brotherhood of British Columbia, the Pacific Gillnetter's Association, the Pacific Troller's Association, the Fishing Vessel Owner's Association of British Columbia, and the Prince Rupert Fishing Vessel Owner's Association.

The most important organization is the UFAWU which draws its membership from fishermen, shoreworkers, and tendermen. The UFAWU plays a crucial role because it negotiates minimum prices for net-caught, raw salmon with the processors. Its bargaining power derives not from its control of fishermen (it represents less than one half of that group), but rather from its representation of shoreworkers and tendermen. In the event of an impasse between the UFAWU and the processors, the union can effectively close down the major, non-cooperative processing plants.

Regional or gear-specific organizations, such as the Pacific Gillnetters Association, represent the particular interests of their membership. They have become increasingly active as regulations have become more specific concerning gear, area, and species. There are also several fishermen's cooperatives, the most important of which is the Prince Rupert Fishermen's Cooperative Association. Its membership exceeds 1,400 fishermen and about 500 vessels deliver to its processing plants.

Processors

Processing can be conveniently divided into canning and fresh/frozen processing. In 1982, of the 75 enterprises reporting production, 56 reported values over $100,000. Eighteen enterprises ran canning lines, and the three largest accounted for 71 per cent of the total value of canned output (Table 3). Forty-two enterprises were active in fresh/frozen processing, with the top three accounting for nearly one half of output. The major enterprises are involved in both canning and fresh/frozen processing. The top three accounted for 54 per cent of the total output.

In 1984 the fourth largest processor, Ocean Fisheries, purchased the assets of the bankrupt, third largest, Cassiar Packing Co. Ltd. Based upon 1982 production data, this concentrated approximately 58 per cent of all processing in three companies (78 per cent of canning and 50 per cent of fresh/frozen). One firm, B.C. Packers Ltd., is clearly the industry leader with

Table 3
Structure of Salmon Processing, 1982

	Number of Enterprises (sales above $100,000)	3 Firm Concentration (per cent of total sales)	5 Firm Concentration (per cent of total sales)
Canned Salmon	18	71	83
Fresh/Frozen Salmon	42	49	58
All Processing	56	54	64

Source: Canada, Department of Fisheries and Oceans 1982, unpublished production statistics.

approximately one half of all canning production and one third of all fresh/frozen processing.

Vertical integration by processors into harvesting is limited. At the turn of the century, the canneries effectively controlled the entire fleet. But over the years, as fishermen accumulated enough capital to purchase their own vessels and as over-capacity came to characterize harvesting, the processors withdrew. In the late 1960s, under the terms of a harvesting licence limitation scheme, processors were restricted to holding 12 per cent of the total number of licenced vessels. In 1981 processor ownership was at the ceiling, although not evenly distributed across gear types. Estimates indicate that the processors held about 40 per cent of the seiner vessels, 36 per cent of the gillnet vessels, and a negligible share of the troll fleet (Schwindt 1982, 143). Processors were heavily represented in the most productive gear types.

Foreign investment in the industry is moderate. As set out in Table 4, companies with direct or portfolio foreign investment accounted for 19 per cent of all salmon processing in 1982. These data overstate current levels of foreign participation because two of the largest processors with foreign investment, The Canadian Fishing Company (85.8 per cent equity previously held by the U.S. company, New England Fish) and Cassiar (49.8 per cent previously held by Marubeni Corp.), have been absorbed by

Canadian enterprises. No major processor is currently controlled by foreign interests.

Table 4
Share of Salmon Processing
by Companies with Foreign Investment, 1982
(per cent of value of production)

	U.S.	Japan	Total
Canning	10.8	11.7	22.5
Fresh/Frozen	3.0	14.2	17.5
All Salmon Processing	6.2	12.9	19.2

Source: Canada, Department of Fisheries and Oceans 1982, unpublished production statistics.

Government

The federal government, through the Department of Fisheries and Oceans, plays a critical role in the fishery because it effectively determines the supply of raw fish. On a short-term basis this means determining the size of a particular run, required escapement for regeneration, and allowable harvest. Adequate escapement is encouraged through policies to limit the catch, such as controls on fishing time, allowable fishing gear, and location of fishing activity. Over the long term the department influences supply through habitat protection and enhancement programs (e.g. hatcheries).

The 1981-1982 budget of the department's Pacific Region office was $84.1 million, two fifths of the value of commercial fish landings reported in Table 1. Forty per cent of the budget was attributable to the Salmonid Enhancement Program (SEP) (Commission 1982, 233-234). Except for the SEP program, these funds were not exclusively allocated to management of the salmon resource. However, some portion of the $108.5 million budget of the department's Ottawa headquarters is attributable to the management of the salmon fishery.

The provincial government has a much more limited role. It provides very modest support for SEP, and beyond that is not significantly involved in the primary sector.

Prices

"Minimum" prices for raw salmon are negotiated each year by the UFAWU and the Fisheries Association, a group of processors representing nearly two thirds of total salmon processing. Negotiations begin in the late spring and are influenced by packers' and importers' inventories, exchange rates, processors' profits, past prices, anticipated runs, and competing supply, particularly from Alaska. Minimum prices often are exceeded. This was especially true during the late-1970s when independent buyers seeking premium quality fish triggered active bidding on the grounds, which substantially raised prices throughout the fishery.

In addition the processors generally pay year-end bonuses to the vessel owners. The bonus serves two functions. It rewards supplier loyalty and ensures deliveries in the forthcoming season. It also provides a payment to capital employed by the vessel owner. Under the traditional "lay system", which is entrenched in contracts between the UFAWU and the processors, the catch was divided into eleven parts: four shares to the nets and vessel, and seven shares to the crew. The formula reflects a historically lower capital-to-labor ratio than at present. The bonus, which is usually not shared with the crew, supplements the return to capital.

The structure of the market has elements of bilateral oligopoly. Both parties are well-informed and adroit bargainers. The minimum price is not, however, the transaction price because of the bonuses and the various non-price benefits the processors provide to the fishermen, such as packing and collecting services, net storage and transportation, ice, moorage and repair facilities, and financing. These services constitute non-price competition among the processors, which is understandable given the homogeneity of the product and the oligopsonistic structure on the buyers' side of the market. In any case, a review of the determination of both monetary and non-monetary elements of the transaction price for raw salmon does not indicate unbalanced market power on either side of the market, and thus no particular advantage in the capture of resource rents.

The Regulation of the Fishery

Theory

The basic elements of market failure in the fishery are best explained with the aid of a simple diagram.[1] Figure 1 represents the long-term relationship between fishing effort and yield. The yield curve, OCW, reflects the relationship between the volume or value of the catch (assuming constant prices) and fishing effort. The curve, OT, represents total costs, assuming a constant cost per unit of "effort". "Effort" is a composite of all factors employed in harvesting. Up to a level of effort, OY, additional effort increases the catch. Beyond OY, additional effort increases the harvest in the short-term, but the thinning of the stock will reduce the total catch in the long-run.

Were the fishery privately owned, OX effort would be expended. At this level, net revenue, BE – the difference between the value of the resource and the total cost of harvesting – is at a maximum. The amount BE is the maximum resource rent available in the fishery. Notice that the rent-maximizing yield, XB, is less than the maximum yield, YC.

If the fishery is organized on the basis of non-exclusive rights to the fish stock, the outcome is very different. Aggregate rent will still be maximized for the entire fishery at effort level OX, but this is not necessarily true for the individual fisherman. He finds, as he increases his catch, that he reaps rents, although this will be at the expense of other fishermen. Effort will be increased as long as total costs lie below total revenue. At an effort level of OZ, costs equal revenues, rents are exhausted, and further additions of effort cease. The fishery is in equilibrium, with a yield of DZ, effort of OZ, and no rents. The loss to society – relative to the rent maximizing solution – has two components: the costs of excess effort devoted to the fishery, DZ minus EX, plus the value of the lost catch, BX minus DZ. The sum of the two components is BE, the rent arising in the original solution.

Depending upon the shape of the total cost curve, an open access fishery can lead to overfishing in the sense that the yield is well below both the optimum and the maximum levels. This is shown in Figure 2, where cost curve OA would lead to a yield of DX, OB a yield of EY, and OC a yield of FZ. Most analysts think the salmon fishery approaches this last situation. Were there no constraints on the harvest, the stocks would be decimated with long-term yields well below their potential.

Public regulation of the fishery has attempted to address the conservation issue while essentially ignoring the underlying, rent-seeking behavior. Moreover, policy seems to have been

Figure 1

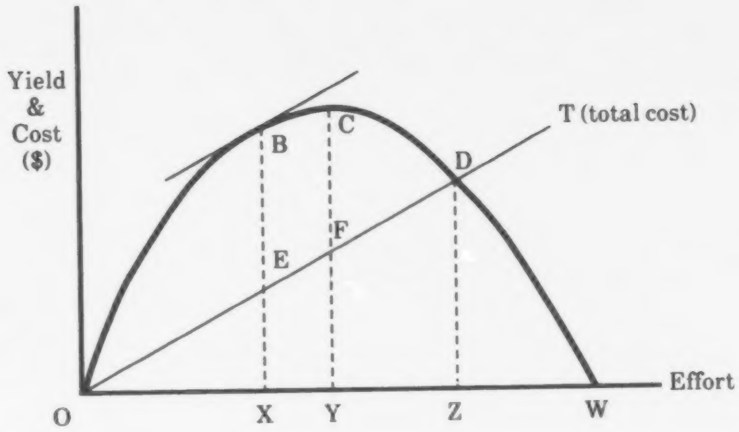
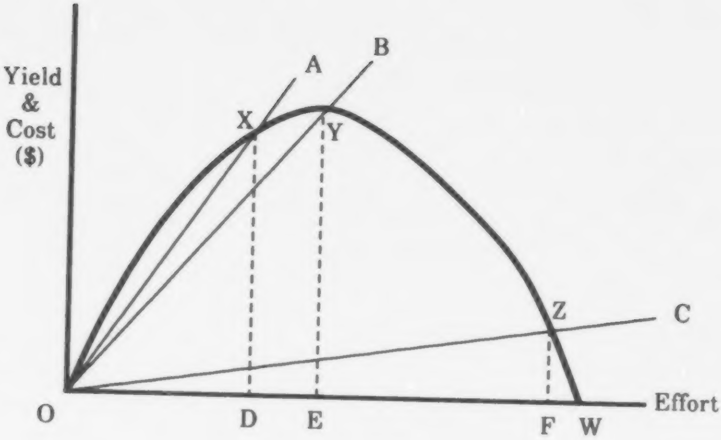


Figure 2


Yield
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Effort

directed toward maintaining maximum yields rather than maximum rents.

Regulatory History to 1968

The current organization of commercial salmon harvesting was largely determined by policy decisions made nearly a century ago. Those decisions were based upon a desire to protect the resource from extinction and a belief in the prevailing concept of free enterprise, which emphasized freedom of entry into economic endeavors.

Because of their migratory patterns, salmon need not be harvested from boats. The most efficient method of harvest is to await their massing in estuaries and then capture them with traps, weirs, or nets as they move upstream to spawn. Salmon need not be pursued; they literally present themselves for harvest. Obviously it is possible to close the mouth of a river system, harvest all returning spawners and eradicate an entire run. This in fact occurred in several fisheries on the Pacific Coast in the 19th century.

An ideal regulatory policy would be to allow the use of traps, but assure adequate escapement to replenish the stock. This implies allocation of property rights over the salmon to particular harvesters because competitive "trapping" is simply untenable (the trap nearest the mouth of the system would capture all the fish). The policy alternatives therefore were an efficient harvesting sector based upon monopoly rights over specific salmon runs or an inefficient harvesting sector based upon a small boat, open-access fishery, the prohibition of traps, and allocation of property rights through rule of capture. Authorities opted for the latter alternative. Traps were restricted and eventually banned outright.

Unfortunately this policy did not resolve the conservation issue. It soon became apparent that technically advanced, strategically located vessels were nearly as effective as fish traps. A small-boat fishery did not assure adequate escapements, and by 1890 net and gear restrictions, time closures, and vessel licensing were introduced to protect the Fraser River run. For the next 80 years, policy vacillated between attempts to curb entry to harvesting and attempts to curb the effectiveness of the existing salmon fleet.

In 1899 the federal government set a 500-vessel ceiling on the Fraser River, with 350 licences allocated to the canneries. Additional licences were tied to expansion of canning capacity. As the price of salmon escalated, canneries were built and more licences granted. Within three years the system was abandoned.

In 1908 the canneries devised a private scheme to curb entry to the north coast fishery. The processors attempted to set ceilings on the number of boats fishing the Skeena and Rivers Inlet. Internal disputes among the processors, however, weakened the scheme. In 1910 the province took over administration of the allotment system, but high prices during World War I and efforts to employ returning veterans in the fishery led to its subsequent abandonment.

During this period policy was erratic and ineffectual. The Sanford Evans Commission of 1917 clearly perceived the basic issue:

> It is clear public duty not merely to conserve the supply of salmon in its present proportion, but to increase it until each year it reaches the economic maximum and it appears to us equally clear that all conditions surrounding the industry should as far as possible be stabilized and the excessive use of capital and labour obviated or prevented. . . . The solution of this problem would not seem to be found in encouraging or permitting the employment of more capital or more labour than can efficiently perform the work. . . . If the cost of production becomes too great all hope of advantage to the public as consumers will disappear. (Cited in Sinclair 1978a, 17-18).

In 1919 vessel licence fees were raised, but in the mid-1920s fees were lowered and restrictions on processing licences were reduced. The 1927 harvest was very poor, and the earlier relaxation of entry restrictions was blamed in part. In response the government maintained open access to the fishery, but moved toward more restrictive controls on allowable gear and more extensive closures. This hobbling of the fleet's ability to harvest was the mainstay of policy up to the implementation of the Davis Plan in 1968.

The Davis Plan

By the mid-1950s it was clear that fisheries policy was severely flawed. Larger, more efficient vessels had entered the fishery, and to counter the impact on escapements ever more restrictive constraints on gear and openings were imposed. In 1958 the government commissioned a study to deal with the interrelated issues of entry, excess capacity, and conservation. The resulting *Sinclair Report* recommended that restrictive licensing and taxes on the catch be implemented to curb entry. A decade later the recommendations were acted upon.

In 1968 the Davis Plan was announced. It called for a "buy-back" program to reduce the fleet and a limited licensing system to restrict the entry of new vessels. Licences were allocated on the basis of an established dependence on the fishery. Existing fishermen were granted the right to participate in the fishery, but were not given rights over a specific portion of the catch. In practice the Davis Plan failed to reduce the harvesting capacity of the fleet.

In the years immediately following implementation of the Davis Plan, salmon prices and harvests rebounded from their 1969 low. In terms of the earlier analysis (Figures 1 and 2), higher prices would shift up the yield curve, thereby generating unclaimed rents which would induce entry. The Davis Plan curbed the entry of vessels, but it did not curb enhancement of the licensed fleet. In their pursuit of rents, licensed fishermen invested in capital additions to their vessels. In the early stages of the plan, this investment often meant simply replacing a small vessel with a larger one. The government tried to halt this circumvention of the spirit of the Plan by attaching tonnage restrictions to the licences. Fishermen responded by "pyramiding" licences of smaller vessels into larger ones and by enhancing the speed, electronic fish-finding equipment, and harvesting power of their vessels. As a result, it was impossible to control the harvesting capacity of the licensed fleet.

The perception of existing and potential rents also scuttled the buy-back program. Fishermen recognized that limited entry, higher prices, and a successful buy-back would raise the incomes of those who remained in the fishery. Therefore, the price at which they were willing to be bought out escalated. The public funds allocated to the buy-back were not adequate to retire a significant proportion of the fleet. The number of licensed vessels declined slightly, but aggregate harvesting capacity increased.

The 1972-1982 Period

Between 1972 and 1979, the Canadian Pacific fisheries experienced a boom. The fisheries were subject to the same inflationary pressures which affected commodity prices worldwide in the mid-1970s. In addition, the imposition of 200-mile fishing zones by the major coastal nations, including Canada, forced excluded nations, particularly Japan, out of high seas harvesting and into foreign markets for marine products. Finally, the emergence of a roe herring fishery added significantly to fishermen's earnings. Roe herring is important to this discussion because a large number of fishermen are active in both the roe herring and the salmon fishery. In the early 1970s herring landings were of negligible importance, but this changed when the Japanese lifted import restrictions because of depletion of their own stocks and their exclusion from foreign fishing grounds. Between 1972 and 1979, the value of roe herring landings in British Columbia increased from $2.3 million to $126.9 million.

The impact of these factors on landings values and wholesale values is reflected in Figure 3. Real values of total marine products increased between 1971 and 1973, declined in 1974 and 1975 (a strike year in the salmon fishery), rose dramatically up to 1979 and then plummeted. Between 1970 and 1979, the real landings value increased by about 275 per cent and the wholesale value by about 235 per cent. The data refer to all marine products, but are driven by the salmon and roe herring figures because of the dominant role of these species.

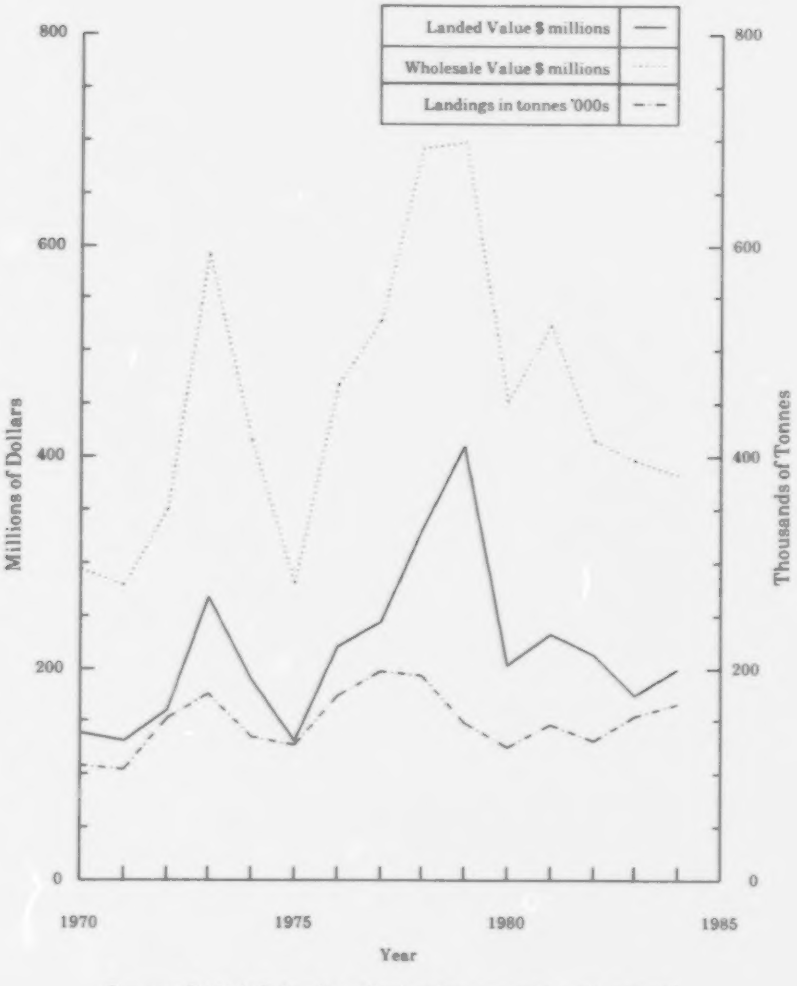
This dramatic increase in the real value of landings was almost all attributable to increases in real prices (see Table 5) and not to increases in the physical volume of the catch. Thus, if the level of fishermen's effort and the real cost of harvesting level inputs had remained constant over the period, the magnitude of resource rents would have increased significantly. This raises two interesting questions – what is the magnitude of the pool of rents attributable to the salmon resource, and where does it go?

The Magnitude and Distribution of Resource Rent

Potential Rents

Quantification of maximum potential rents requires an estimate of both highest potential value and minimum potential costs. On the cost side, estimates will vary widely according to which institutional constraints are assumed to be binding. Probably the most cost-efficient method of organizing the salmon fishery would be to allocate sole ownership of the entire harvest or of the harvest of entire drainage systems to individual enterprises. Under such a regime the enterprise holding the harvesting right could choose the most efficient technology to maximize long-term rent – probably fish traps and weirs. If its harvesting rights were long-term (i.e. over several regeneration cycles), the monopoly firm would be motivated to allow adequate escapement to ensure future harvests. Moreover, the significant costs incurred by public authorities in their attempts to maintain order in the common-property fishery would be reduced. The monopolist would be expected to police its property and to enforce its

Figure 3
Landed and Wholesale Value of Fish and Fish Products in B.C. 1970-1982 (1981$)



Source: British Columbia, Marine Resources Branch, annual.

property rights. While most observers agree that such an organization would be technically the most efficient, it is politically impossible to implement, and therefore it should not serve as a baseline for the calculation of maximum potential rents.

Table 5
Average Adjusted Landings Prices,[1] 1970-1982
(1982$)

	all marine products ($/kilogram)	salmon ($/kilogram)
1970	1.46	1.68
1971	1.34	1.83
1972	1.16	1.64
1973	1.67	1.63
1974	1.56	2.67
1975	1.14	2.43
1976	1.36	2.80
1977	1.31	2.70
1978	1.89	3.36
1979	3.04	3.82
1980	1.81	2.81
1981	1.52	2.34
1982	1.51	2.63

[1] Landed value divided by landed kilograms

Source: Canada, Fisheries and Oceans, annual.

Given the inertia imposed by interest groups within the fishery, it is reasonable to assume that the salmon harvest will continue to be carried out with a small-boat fleet. Unfortunately there is no systematic study which sets out the dimensions of an ideal small-boat salmon fishery. Nevertheless, in its 1982 report the Commission on Pacific Fisheries Policy assumed that the salmon catch could be taken with half the existing fleet, at half the current cost (Commission 1982, 112). While the Commission published no background analysis to support this estimate, it seems reasonable, given the extensive restrictions on gear and the limited number of days in the season vessels are permitted to fish (see Sinclair 1978b, 27-32). In 1982 the landed value of the salmon harvest was about $150 million. If it is assumed that the fleet was just covering costs, the catch could have been taken at a cost of $75 million, leaving resource rents of $75 million.

If the fleet were halved and entry restricted, the fishery would still exhibit common-property problems. Government would have to continue to set allowable catch limits and continue to enforce these limits, albeit the costs of enforcement would be somewhat less with a reduced fleet. In any case, when harvesting and enforcement costs are considered, the maximum potential rents would be less, probably substantially less, than $75 million.

Actual Rents: Existence, Distribution and Dissipation

In theory the difference between the value of the salmon resource and the cost of harvest could be captured or dissipated by any combination of fishermen, processors, distributors, and the crown. Fishermen would benefit if landed prices exceed their costs, defined to include normal returns to their labor and invested capital. The processors could capture the residual by establishing a margin between wholesale and landed prices that exceeds their normal cost. The crown could claim rents through its vessel-licensing fees or indirectly through taxes levied on fishermen, processors, or both. Finally, downstream participants could extract the residual via a high retail/wholesale margin.

Harvest Stage

To test the hypothesis that resource rents are taken at the harvesting level would require a comparison of fishermen's revenues and costs. It is clear that the average annual gross fishing income for all licensed vessels significantly increased over the 1970-1979 period. This is not surprising given that landings values increased and that the number of licensed vessels was constrained by regulation. It is also clear that the cost per unit of fishing effort increased. Higher landed prices induced fishermen to fish "harder." This forced regulators to place more stringent controls on fishing time and gear. In response, fishermen invested in technology which allowed them to move quickly from one opening to another and which increased their effectiveness once on the fishing grounds (Sinclair 1978a, 91). Estimates indicate that harvesting capacity doubled or perhaps trebled during the 1970s (Commission on Pacific Fisheries Policy 1982, 79). It has been estimated that the capital value (excluding licence values) of the fleet increased from $91 million to $432 million between 1969 and 1982 (Clarkson Gordon 1983, 25).

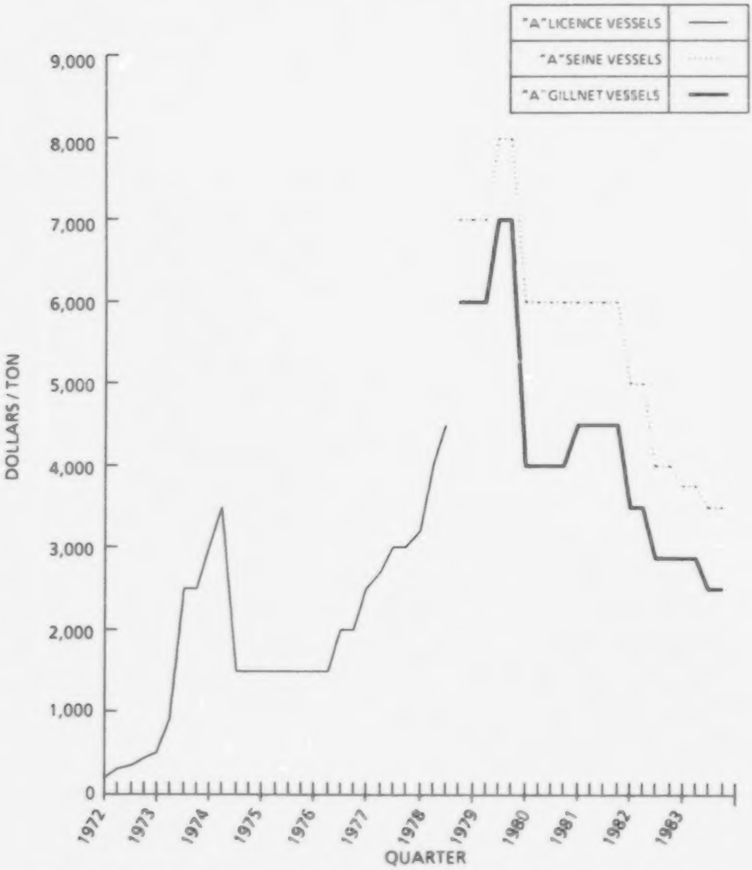
Theory predicts that vessel entry, or "capital stuffing", of the existing fleet would continue until all rents were exhausted. Did this happen? Without accurate knowledge of actual costs and revenues, alternative evidence of undissipated rents must be examined.

One method of addressing the "dissipation versus capture" issue is to examine the market value of the fishing licence (i.e. the right to harvest salmon). The right to participate in an economic activity commands a positive price only if the participant expects to earn revenues above his opportunity costs. The market price of the licence should reflect the present value of the stream of net revenues (rents) expected from the activity. At the outset of the licence limitation program licences had little value. By 1978 salmon licences had a market value of nearly $4,000 per licensed ton (Figure 4).[2] The average vessel in 1977 was approximately 9.7 net tons, and thus had a licence valued at $38,800. In 1978 the transfer of licences between gear types was prohibited and a maximum licensed tonnage was imposed. This curbed the practice of "pyramiding" several gillnet licences into a single seine vessel and resulted in differential market values for seine and gillnet licences. In 1979 seine licences were valued at about $7,500/ton; the average seine vessel was 30 net tons, and thus the average seine licence was valued at $225,000. In many instances the value of the licence exceeded the value of the vessel to which it was attached.

The existence of a market value for the right to participate in an economic activity is commonly viewed as *prima facie* evidence of rents. Under stable conditions, where producers are well informed about both the sustainability of an entry-restricting licensing scheme and the effects of entry restriction upon costs and revenues, the use of the licence value to estimate the present discounted value of a future stream of rents is reasonably accurate. Under unstable conditions such as characterized the fishery over the last decade, however, the licence value can at most be viewed as a proxy for the fishermen's perception of the present value of a very uncertain future stream. What then was that perception?

The data arrayed in Table 6 provide an estimate of rents at the harvesting stage. Column 1 sets out the nominal aggregate value of "A" salmon licences. It was calculated by multiplying fleet tonnage by the appropriate licence-ton transaction price. Column 2 reflects the annual return in any year from the nominal value of licences if invested at the Canadian Treasury bond rate. This provides a lower bound for the perceived value of capturable rents. It is low because fishermen undoubtedly

Figure 4
Commercial Salmon Licence Values
Quarterly 1972-1983



N.B. In 1978 regulations were changed, disallowing the transfer of licences between gear types (e.g. converting a gillnet licence to a seine licence) and a maximum tonnage was imposed.

Source: Canada, Department of Fisheries and Oceans. Unpublished data and correspondence with processing companies collected by D. Reddick.

applied a much higher discount rate given the intrinsic riskiness of the licence asset, and therefore a much larger stream would be required to support the aggregate market value of licences.

Unless purchasers of licensed tonnage were consistently misinformed, or irrational, over a 10-year period, rents were being captured and not completely dissipated at the harvesting stage.

Table 6
Estimate of Rents at the Harvesting Stage

	Nominal Value of all Licences (millions of $)	Annual Stream of Returns (millions of $)
1972	14.4	0.5
1973	70.4	3.7
1974	110.2	6.5
1975	68.4	5.1
1976	79.5	6.9
1977	129.9	9.8
1978	195.4	17.2
1979	345.1	42.2
1980	227.0	30.7
1981	243.4	42.9
1982	176.8	23.1
1983	146.3	13.8

Source: Estimates by author.

Processing Stage

The majority of research dealing with rent dissipation in the fishery has been directed at the harvesting sector. However, given the oligopsonistic structure of the market for raw salmon it is plausible that a portion of rents might be captured by processors.

One relevant indicator is the difference between the wholesale value of processed fish and the unit landed value of raw fish. Figure 3 indicates that the ratio between landed value and wholesale value remained roughly constant between the years 1970 and 1979. The absolute difference in 1981$, however, increased from $150 million to $280 million. If real processing costs did not rise significantly, much of this increased revenue could represent rent retained by processors.

Industry representatives argue that the difference between landed and wholesale values is misleading because landed values exclude post-season bonuses paid by processors to fishermen. During the late 1970s, bonuses as a proportion of the total amount paid for raw fish increased, and thus landed values increasingly understated the full cost to the processors of the resource. Furthermore, they argue that the downturn in export markets after 1979 has encouraged canners to increase supply to the domestic market. While domestic list prices have not declined, allowances and discounts have increased. Thus the wholesale value, which is based on these list prices, overstates the true transaction value. These two factors would reduce the actual margin between the processors' cost of inputs and value of output and would lower actual financial returns compared to observed margins.

In fact, over the long term, salmon processing companies have not been particularly profitable. The financial performance of B.C. Packers Ltd., the dominant firm, is illustrative (Table 7). These are consolidated data; returns uniquely attributable to the processing of salmon harvested in Canadian waters cannot be isolated. Nevertheless, the figures are indicative. Although in years of substantial absolute margins, such as 1972-1973 and 1976-1978, profits are high, over the long term they are moderate.

If rents have not been retained by processors as excess profits, they could have been dissipated. Dissipation would occur if processors had higher than necessary costs or lower than possible revenues. Arguments have been made that both sources of dissipation exist. Shaffer (1979) contends that the processors maintain chronic excess capacity and that they have failed to produce the highest value product mix.

There is excess capacity in processing in the sense that canning lines, and the packer and collector fleet are not fully employed except at the peak of an extraordinarily heavy run. The rationale for maintenance of this capacity is that it plays a role in non-price competition for the raw fish. With abundant capacity, the processor can guarantee acceptance of all fish offered to him, and a large collecting and packing capacity ensures a rapid turnaround for the fisherman. Both of these services take on greater importance with more restrictive fishing closures because mobility becomes critical to the fisherman in moving from one opening to another. It is therefore incorrect to

Table 7
British Columbia Packers Limited
Financial Performance 1970-1983

	Profit Before Tax (Millions of $)	After Tax Profit on Equity (per cent)
1970	3.61	7.0
1971	4.15	8.3
1972	5.46	10.5
1973	18.28	25.6
1974	2.92	4.2
1975	.06	0.1
1976	7.77	11.5
1977	14.42	19.7
1978	20.01	20.0
1979	6.78	7.4
1980	(9.99)	loss
1981	(1.05)	loss
1982	(14.43)	loss
1983	.62	3.1

Source: British Columbia Packers Ltd., annual.

characterize this investment as "rent dissipation" on the part of processors. Fishermen are offered a combination of monetary and non-monetary benefits for their catch. The package includes monetary consideration and non-priced services which enhance the individual fisherman's ability to catch fish. Were the processors to eschew this non-price competition, landed prices would be bid higher and ultimately fishermen would pay directly for the services they required. In fact, processors are reducing the level of these services, in part because of the experience with cash buyers during the late 1970s. In that boom period, an influx of independent buyers on the fishing grounds competed for fish on the basis of price alone. They offered no attendant services and, to the chagrin of the established processors, they had no trouble attracting supplies. In any case, the maintenance of surplus capacity and the provision of unpriced services can be viewed as transfers from the processors to the fishermen and not as a dissipation of rents.

It has also been alleged that the processors willfully committed too many resources to the canning and too few to the freezing of salmon (Shaffer 1979, 115). The allegation was based in part on the somewhat slow response of the processors to increases in the price of frozen salmon relative to canned product. The decline in the Japanese market for frozen salmon in 1980 suggests, albeit with hindsight, that the slow conversion to freezing was a reasonable strategy.

The evidence suggests that in years of good catches and high prices, processors do very well, but over the long-run, profits are not significantly higher than the average for Canadian manufacturing in general, and food processing in particular. In a sense, the processors have accommodated the fishermen in the dissipation of rents through the offering of abundant capacity in packing, collecting, and processing. However, had they competed solely on a price basis, the result would have been higher landed values and, presumably, even greater investment in the fishing fleet.

Government

Currently the crown captures a share of the resource rents through commercial fishing licensing fees. For salmon, these fees range from $200 to $800 per vessel, depending on size and gear. The revenues generated by these fees, $2.5 million in 1981, are insignificant, relative to both the value of the harvest and the amount spent by the crown to manage the fisheries. (Commission Pacific Fisheries Policy 1982, 93).

Policy

Policy goals for the Pacific fisheries have not been clearly and systematically articulated. Apparently they include conservation, income maintenance, and rent capture. The conservation goal has historically enjoyed the greatest emphasis and has been achieved inasmuch as the salmon stock is not in imminent danger of collapse. The income goal has not been achieved. Fishermen's incomes remain highly variable. While revenues on average were high in the late-1970s, in the 1980s the decline in prices, high interest rates, and an increased debt burden have left many fishermen in a precarious financial position. And, of course, policy has encouraged rent dissipation not capture.

It is widely recognized that "Canada's Pacific fisheries are at a crisis point" (Commission 1982, viii). It is not known, however, whether or not policy can be framed which will simultaneously conserve the fish stocks, generate adequate per capita income to fishermen, and capture rent. The source of the problem is the common property nature of the resource; solutions to the problem require creation of property rights to the resource.

Monopoly

An obvious solution to the common property problem would be the assignment of monopoly rights to the resource. In the salmon fishery, this could involve the allocation of exclusive property rights to all species or to particular runs. The holder of the rights would be motivated to use the least-cost harvesting technique, probably traps and weirs at the river mouths. The owner would have a vested interest in adequate escapement and in the maintenance of upstream spawning beds. Conservation goals would be achieved, and rents would accrue to the monopoly. Were it a private sector monopolist, the crown could extract rents through taxes or royalties.

This solution is attractive from an economic perspective, but untenable politically. It would eliminate the small-boat fishery and confiscate the perceived property rights of existing fishermen. It is not a serious policy option.

Recommendations of the Commission on Pacific Fisheries Policy

In its final report, the Commission on Pacific Fisheries Policy recommended sweeping policy changes, particularly for the salmon and roe herring fisheries. With respect to the salmon fishery, the Commission framed policies to reduce the fleet by one half and to capture for the crown the resulting rents.

Fleet reduction was to be achieved through a buy-back scheme and the continuation of limited licensing. Existing licences were to be subject to a sunset clause, and all would expire at the end of a decade. In the interim, fishermen could choose to work the licence or sell it back to a crown corporation created for that purpose. Rents were to be extracted through a double-barrelled program of royalties on the catch and a licence auction scheme.

Depending on the salmon species, the proposed royalties ranged from $.05 to $.10 per pound and were to be collected from the purchasers of the raw fish. Applying the proposed royalty scheme to the 1982 harvest would have generated $12.3 million for the crown. This represents about 7 per cent of the landed value of all salmon and, assuming half the fleet was to be retired, about 7 per cent of the total cost of the buy-back program (DeVoretz and Schwindt 1985).

In its preliminary report the Commission recommended royalties, but in its final report it suggested both royalties and a licence auction. The target fleet was set at about 2,500 vessels. In each year of a 10-year transitional period, 250 licences would be auctioned. The licences would be valid for 10 years from date of issue, and only holders of licences would be allowed to bid. A successful bidder would have to sell his existing licence to the buy-back authority. At the end of 10 years, there would be 2,500 licences with staggered expiration over the following decade. Upon first analysis the policy seems an equitable, orderly method of reducing fishing capacity:

> Those who purchased licences privately before 1983 will have ten years to work them and capture any rents capitalized in their original sale price. The target fleet will be achieved in 10 years, and thereafter public resource managers will have the flexibility to either increase or decrease capacity on an annual basis. Those giving up existing licences will be fully compensated. The most efficient fishermen will outbid the less efficient thereby automatically rationalizing the fleet. And, importantly, the public will begin to capture the resource rents. (DeVoretz and Schwindt 1985, 358-9).

More detailed analysis of the bidding scheme shows, however, that very different outcomes are possible over the decade of transition, depending upon the conjectures of the fishermen. Because the retirement of vessels was made voluntary over the 10-year period, there would be no way to know how many vessels would participate in the fishery in any given year. Under the circumstances, the prospective seller of an existing licence and the buyer of a new licence would face extreme uncertainty about the number of competitors in the fishery over the decade. This would seriously confound price determination of both existing and new licences. Alternative scenarios imply that in most instances licence auction and royalty revenues would exceed the cost of the buy-back program and under some conditions would capture all rents in the sector (DeVoretz and Schwindt 1985).

Not surprisingly, the government did not immediately move to implement these policies.

Pacific Fisheries Restructuring Act

In June 1984 the Minister of Fisheries and Oceans announced draft legislation to restructure the Pacific fisheries. The core elements of the legislation bearing on the salmon fishery were a buy-back program, area and gear licensing, provision for royalties, and the assignment of fishing allocations or quotas.

The novel element of the legislation was the proposed use of quotas by which fishermen would be assigned the right to harvest a specific number of fish. Quotas are, in theory, an ideal method of curbing the basic cause of over-capacity because they remove the incentive for the individual fisherman to increase his ability to capture more of the common property resource. With a quota, the fisherman would seek to harvest his licensed catch at the lowest possible cost. Quota systems are appropriate for some fisheries, but not so for the salmon fishery:

> To ensure compliance with the quota, reliable information on landings is required. If a fishery is based on several stocks that require individual management, separate quotas may have to be issued for each; adjusting quotas in fisheries that depend on stocks that fluctuate widely and unpredictably is difficult. These latter problems preclude adoption of quota licences for the salmon and roe-herring fisheries. (Commission 1982, 84).

The legislation also provided for imposition of variable landings charges (royalties) based on the financial condition of the fishery. Royalty rates were not explicitly set out, but were subject to a ceiling of 10 per cent of the landed price. It is important to note that the draft proposals clearly recognize the public's right to a share of the resource rent. With the change of government in September 1984, this legislation was dropped. As yet no alternative policy has been introduced.

Policy Direction

It seems clear that policy is moving in the direction of another attempt to reduce capacity in the harvesting sector through a publicly funded buy-back program. Despite ample warnings, including those of the Commission on Pacific Fisheries Policy, it is not clear that policy makers accept the necessity of claiming the rents generated by such a capacity reduction, lest reinvestment once again thwart the intent of the program. The reluctance of politicians to deal with the rent dissipation issue is understandable; resolution will require the exclusion of some group from the resource rents.

The first and perhaps hardest issue to resolve is the ownership of the resource. Does it belong to the public, to established commercial fishermen, to sports fishermen, to native peoples, or to all who would pursue it? This question is rarely directly addressed. In its report the commission stated that,

> . . . a realistic portion of revenues derived from commercial fisheries should now be directed away from excess catching capacity toward recouping those costs to the public, reducing bloated fleets and enhancing the resource. (Commission 1982, 93).

The implication is that the crown should capture enough rent to pay for managing, administering, and enhancing the resource and to fund the reduction of the fleet.

Both the licence limitation and the buy-back schemes of the late-1960s implicitly recognized and entrenched the rights of established commercial fishermen to the resource. For obvious reasons, the excluded group, potential commercial fishermen, did not mount a strong lobbying campaign against their exclusion. Currently, however, tensions among competing claimants have increased. Two recent court cases are illustrative. In one the Gulf Trollers Association disputed the government's right to discriminate against them in favor of sports fishermen in the allocation of chinook salmon. In another an association of seine vessel operators charged that the government was discriminating in favor of gillnet operators. It can be confidently predicted that as restrictions become more severe, competition between all claimants for the resource will increase both on the fishing grounds and in the courts.

It is futile finally to seek a consensus on the allocation of harvesting rights. Given that the sustainable yield of salmon is relatively fixed, any allocation will create losers. These losers will not be unorganized potential entrants, with only a weak claim to the resource. They will be issue-unified, politically astute, sector participants, with a great deal to lose. Interest group theories of policy making suggest that those losers will do their utmost to frustrate the allocation of the resource to competing claimants. And because any distribution must be arbitrary, they will have a legitimate case. Any attempt at piecemeal distribution – between gear types, or between commercial and sport fishermen, or between Indians and non-Indians – will be fraught with difficulty and prone to stalemate.

Under the circumstances, it might well be an opportune time to consider more extreme, but ultimately more viable, solutions. An obvious but rarely discussed alternative would be clear enforcement by the government of the public's right to the resource. This would involve the politically painful repudiation of all private interest claims to the resource except in those instances where the crown had formally alienated fishing rights.[3] In this regard, Indian claims would be an area of concern.

Once crown ownership was clearly established, and its right to the resource rents entrenched, policy makers would have to deal with the rationalization of the existing fleet and the future organization of the harvest. A first step toward the resolution of both these issues would have to be a clear determination of the distribution of any future rents generated in the fishery. If the crown decided that rents were to be shared with the fishermen, this would immediately complicate the retirement of vessels and licences because potential sellers would demand the present value of the net returns they would have received had they remained in the fishery. Because of the depressed state of the fishery, some vessels would be withdrawn quickly and at a low cost to the buy-back program. However, as retirement began to make a substantial impact on the capacity of the fleet, the reservation price of remaining fishermen would surely rise.

Furthermore, if some rents were left to be captured in harvesting and were allocated on the basis of volume landed, this would inevitably encourage fishermen to increase their catching capacity. The implication is that the crown must not just claim the right to the rents, it must also extract all of them to prevent dissipation. This is the core problem confronting policy makers today. The Pearse Commission recommendations would have solved the problem because in theory the auction of the harvesting rights would have captured all expected net returns. Entry and exit would have been predicated upon the expectation that super-normal returns would no longer be available in the fishery. This would eventually moderate the demands of those exiting and would curb the expansion of capacity. However, even after the transition period, fishermen would have to predict returns in an industry characterized by substantial fluctuations in both selling price and volumes harvested. Given the inherent uncertainty, it would be difficult for fishermen to develop a rational bidding strategy. This explains, in part, their successful resistance to the proposal.

A possible but radical solution would be to change the role of fishermen from competitors for the resource to contract harvesters for the resource owner. Rather than bidding for fishing licences, markets could be organized to auction off the harvesting function with the allocation going to the low cost bidder(s). Fishermen can control neither the volume nor the value of the harvest, but they can control their own costs and would have the incentive to do so under such a scheme. The crown would be responsible for negotiating the price of the raw fish with processors and would thus bear the risk of price and volume fluctuations. If value exceeded harvesting costs, rents would accrue to the crown. In very poor years, the government could conceivably pay more for the harvest than it reaped from the processors. In any case, the system would reduce rent dissipation and would reduce the uncertainty confronting the fishermen.

This is not the place to provide detailed elaboration of alternate methods of organizing the harvesting sector. It is enough to note that such alternatives have not been explored and deserve to be. The Canadian Pacific salmon fishery is in crisis and will remain that way until a radical solution is adopted. It should be brought home to all interest groups that the public will not spend significant sums indefinitely to perpetuate the dissipation of rents accruing to a publicly owned resource.

Notes

1. This section draws from Gordon (1954) and Fraser (1977).

2. These licence values must be viewed as approximations. They are based upon fishermen's estimates and information from processors and not upon actual transaction prices. No official record of transaction prices exists. Other research has cited different licence values. Fraser (1977, 50) estimated average licence values per vessel for 1973, 1974, and 1975 at $2,711, $17,125, and $9,540, respectively. Given that the average vessel size at that time was approximately 9.5 tons, this implies per ton licence values of $285, $1,803, and $1,004 for those years. This is not inconsistent with our figures. However, the Commission of Pacific Fisheries Policy (1982, 103) states that the market value of salmon licences was roughly $7,000 per ton in 1974, which is well above our estimate.

3. The crown would appear to have the authority to do this.

> Without attempting to encompass the entire legal implications of these rulings it seems logical to conclude that insofar as the tidal waters in British Columbia are concerned the Government of Canada has the power to affect the proprietary right in the common fishery so long as all citizens are equally affected. . . . An essential feature of the various judgements is that all citizens shall have the same opportunity and be equally treated when proprietary rights in the common fishery are affected.
>
> (Sinclair 1960, 88-89)

However, one can expect considerable resistance from the fishermen.

> We cannot support any theory that arbitrarily deprives an established fisherman from pursuit of his livelihood. . . . The abrogation of the established rights of fishermen by naked economic force would remove the burden of mismanagement from the Department, by placing excessive, inhumane hardships on fishermen . . . Perpetuity of the fishing privilege

> was implicit in past licence management. The Department was fully cognizant of the spiraling cost of tonnage paid by fishermen as they attempted to secure their position in the industry. We condemn an attitude that ignores this commitment and advocates the elimination of fishermen by decree as a governmental legal right. The end does not justify the means.
>
> (Fleet Rationalization Committee 1982, 18-19)

This paper benefitted from comments by seminar participants at the Institute of Fisheries, University of Tromso, and the Institute of Fisheries Economics, Norwegian School of Economics and Business Administration.

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